DOCUMENT RESUME

ED 411 434 CE 074 760

AUTHOR	Owens, Tom
TITLE	The Boeing Company's Manufacturing Technology Student Internship. Final Evaluation Report for 1996.
INSTITUTION	Northwest Regional Educational Lab., Portland, OR. Education and Work Program.
SPONS AGENCY	Boeing Co., Seattle, WA.
PUB DATE	1997-05-30
NOTE	103p.
PUB TYPE	Reports - Evaluative (142) -- Tests/Questionnaires (160)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Academic Achievement; *Experiential Learning; Grade 11; Grade 12; High Schools; *Internship Programs; Job Skills; *Manufacturing; Postsecondary Education; Pretests Posttests; Program Effectiveness; Program Evaluation; Student Attitudes; Student Experience; *Summer Programs; *Technology Education
IDENTIFIERS	Boeing Company

ABSTRACT

A study evaluated The Boeing Company's Student Internship Program for students enrolled in a manufacturing technology program. The programs in the Seattle (Washington) and Portland (Oregon) areas provided students with three progressive internship levels offered in the summers of grades 11, 12, and 13 (the first year of community college). The 1996 evaluation involved review of documents describing the internship structure, student selection process, curricula, and written pre- and post-surveys of interns. Data indicated the program had motivated some students to stay in school and continue education in their areas of interest. It provided students with valuable work experiences in specific areas of manufacturing technology and important basic employability skills. The internship was very successful in teaching the manufacturing-related skills designated at each level. Learning these skills helped students relate skills and knowledge acquired in school to those used in the workplace. Student interns consistently rated the learning environment of the internship superior to that of the high schools from which they came. They consistently identified teamwork, hands-on experience, and learning manufacturing-related skills as major strengths. Comparison of responses across the three levels indicated the percentage who perceived they had excellent or good skills in writing and using mathematics increased. It remained high and stable in using science. (Appendixes include pre- and post-survey results for all three levels for both Seattle and Portland.) (YLB)

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Northwest Regional Educational Laboratory

EVALUATION REPORT

THE BOEING COMPANY'S MANUFACTURING TECHNOLOGY STUDENT INTERNSHIP

Final Evaluation Report for 1996

by

Dr. Tom Owens, Senior Associate

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May 30, 1997

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THE BOEING COMPANY'S MANUFACTURING TECHNOLOGY STUDENT INTERNSHIP

Final Evaluation Report for 1996

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May 30, 1997

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ACKNOWLEDGMENTS

This report on The Boeing Company Student Internship Program would not have been possible without the cooperation of a number of people. We wish to thank Jim Murphy and Judy Phelps from The Boeing Company and the other staff at Boeing who helped us design the evaluation and collect the data.

Lynn Wolters at Mt. Hood Community College arranged for the evaluator to observe the internship process in the Portland area and collected student survey data. Kate Warziniack of the Northwest Regional Educational Laboratory (NWREL) supervised data entry and chart preparation, and Catherin Violante assisted with text entry. Final editing was done by Amy Blake and Dennis Wakeland of the Education and Work Program. We also wish to thank the student interns and instructors, without whom there would be no program.

EXECUTIVE SUMMARY

In February 1993, The Boeing Company first approved a summer internship program for students enrolled in a manufacturing technology program. This program provides students with three progressive internship levels offered in the summers of the 11th, 12th, and 13th grades (through the first year of community college). The Internship Program is meant to accomplish the following objectives:

1. Introduce students to career opportunities in manufacturing technology
2. Teach basic manufacturing skills
3. Help develop workplace-basics skills
4. Help students plan for their future
5. Assist in high school drop-out prevention

By the summer of 1996, over 200 students were participating annually in the Boeing student internship program in the Seattle and Portland areas. This report summarizes major findings from the 1996 Internship Program and presents recommendations based on these findings.

Purpose

The Boeing Company contracted with the Northwest Regional Educational Laboratory (NWREL) to evaluate the Student Internship Program. The purpose of this evaluation is to: (1) describe comprehensively the operations and outcomes of the Internship Program, (2) provide information for continuous quality improvement of the Internship, (3) document the impact of the Internship on students and others, and (4) identify promising practices related to the Internship that could be adapted by others in business and industry interested in developing similar student internships.

Methodology

NWREL's 1996 evaluation of the student internship in manufacturing technology involved careful review and study of documents describing the internship structure, student selection process, curricula, written surveys of interns conducted both before and after their summer internships, and an interview of former interns, which was presented as a separate report.

The written surveys developed by NWREL consisted of pre- and post-surveys for each internship level: basic, intermediate, and advanced. Each set of pre- and post-surveys included questions on the following subjects:

- The amount of knowledge in the manufacturing competencies students had before and after their internship—for example, precision measuring—to be taught at the different levels (basic, intermediate, or advanced)
- Broader employability outcomes such as group participation, and educational and occupational plans
- Interns' assessments of the learning environments in their home high schools the previous year and during their internships
- The strengths and weaknesses interns perceived in the Internship Program and suggestions for improving it

Major Findings

1. Data from this year and the previous three years indicate that the Boeing Internship Program has motivated some students to stay in school and continue their education in their areas of interest. The Internship provides students with valuable work experiences in specific areas of manufacturing technology and important basic employability skills. Almost all interns we surveyed in the past three years indicated they would recommend the Internship to their friends.

2. The Internship is very successful in teaching the manufacturing-related skills designated at each level of the internship. Data for 1996 and the previous three years consistently show that students' knowledge of these skills increased significantly by the end of each summer internship. Learning these skills during the Internship helped students relate skills and knowledge acquired in school to those used in the workplace. However, the Internship has limited impact on changing instruction in those schools from which student interns were selected. Curriculum development work in 1996-1997 based on the MTAG competencies should help develop a more solid school-based curriculum complementing the Internship.

3. In the past four years, student interns consistently rated the learning environment of the Boeing Internship superior to that of the high schools from which they came. For example, 97 percent of the interns indicated their Boeing instructors helped them see the purposes of what they were learning, whereas only 72 percent of the interns indicated so about their high school teachers. However, there is evidence that the high school environment has improved in the past year with regard to opportunities for hands-on learning and courses being taught in an interesting manner.

4. Over the past four years students consistently identified teamwork, hands-on experience, and learning various manufacturing-related skills as major strengths of the Internship. Students have generally become more self-confident after their summer internships.

5. Students were generally satisfied with the recruiting process and felt the orientation was helpful. Most students were able to handle the interview questions. However, students wanted to have more information before the interview.

6. Over the past four years students have expressed that they had benefited enormously from hands-on experiences through the Internship. However, they still felt the opportunities for hands-on experiences during the internships could be strengthened. The advanced interns were especially satisfied with their one-on-one hands-on experiences.

7. By the end of the advanced internship, at least two-thirds of the advanced interns felt they knew "a lot" about group dynamics and communication, safety and health, and shop skills. Only 12 percent felt they knew " a lot" about business economics and resource management. These variations seem logical in terms of the more critical skills needed for entry level positions in manufacturing technology.

8. When comparing intern responses across the three levels of Internship, the percentage who perceived they had excellent or good skills in writing and using mathematics increased (from 70 percent to 100 percent in writing and 61 percent to 72 percent in mathematics). It remained high and stable (at about 80 percent) in using science. This probably reflects the Internship's emphasis on integrating mathematics and writing into the technical skills training.

The findings in this report are organized around the levels of internship. Findings related to this year's internships are compared with the previous three-year findings whenever a trend is apparent.

Recommendations

1. **Continue the Internship Program**

   Over the past four years the evaluation results have facilitated continuous quality improvement for the Internship Program. The results of the evaluation also clearly indicate that the Internship has had a positive impact on many students in their educational aspirations and career plans. The Boeing staff is to be commended for introducing the advanced Internship into other manufacturing companies and aggressively disseminating information about the Internship Program to many other companies across the country.

2. **Connect with school-based programs**

While the Internship Program has operated effectively and benefited participating students, the internship experience generally stands isolated from the students' high school curriculum. Thus, from a systemic perspective, its full impact on the education of high school students is limited. As is true for most school-to-work efforts across the country, there is a crucial need for an effective link between school curriculum and work-based experiences. We recommend that a clear link be made between the content of the summer internships and the new MTAG curricula being developed and used in some of the Seattle-area high schools. The Internship should continue to focus on hands-on activities that students do not have the opportunity to perform in school settings. Additionally, we recommend:

- Student selection criteria should be structured to admit to the program only those students who: 1) are interested in manufacturing technician work as shown in their individual career and education plans, 2) have taken one or two CORD applied academics courses or other academic courses that include application to the workplace, and 3) have taken at least two sequenced courses in manufacturing technology or a related field.

- The consecutive three-year internship should equip interns with skills adequate for an entry level manufacturing technician position. Efforts need to be made to help these students find a job in the field after they have completed manufacturing-related degrees.

- To connect the interns' school coursework with their summer internship experiences, participating schools might also be required to have a team of at least four academic and vocational teachers, one school counselor, and one school administrator to observe at least one day of the first year internship. The team would then be better able to establish the means to address some of the internship competencies in regular school-year courses.

3. **Provide an exploratory workplace experience**

For those 10th grade students who are not sure if they want to go into the manufacturing field, an exploratory workplace experience might be designed jointly by Boeing and participating high schools; possible programs might be a one-week summer camp, visitation to several manufacturing firms, and other school-based experiences. Such a program could also provide these students with some overall understanding of the workplace and allow them to complete a project demonstrating the relevance of school work in the real world. These students could then be candidates to participate in the consecutive three-year internship if they demonstrated serious interest in a career in manufacturing. The Boeing Company could use experiences like these to screen internship candidates.

4. **Improve the internship curriculum**

Our data show that many of the student interns were interested in the relationship between manufacturing and engineering. Next year's curriculum might include this topic. The internship should continue to focus on hands-on activities that students do not have the opportunity to perform in school settings. The necessary classroom instruction provided during the internship should be as short as possible and be directly related to the hands-on projects that follow.

5. **Study those who become Boeing employees**

A preliminary study of the 67 Boeing interns who have recently become full-time employees of the Boeing Company has begun. Such a study is critical in determining the long-term impact of the Internship and should be continued over the next three years to determine changes that might be needed in the content or structure of the program. The follow-up study should help address the question as to whether a third year internship is necessary since some of the interns hired by Boeing had only two years in the Internship while others had three years.

6. **Help student interns find relevant jobs**

Last year most Boeing interns had temporary jobs unrelated to manufacturing. We recommend coordinating with regional manufacturers that hire part-time workers for possible employment of students during the school year or as summer replacements. For example, in partnership with Spokane Community College, Kaiser Aluminum Company in Spokane hired students to be summer replacement workers for its employees on vacation. The program has been very successful. Many of those student interns have since been hired by Kaiser.

7. **Continue to use evaluation as a tool for program improvement**

Over the past three years, the program evaluation has proved to be useful for continuous quality improvement. For next year's evaluation, we recommend: 1) a follow-up study of this summer's graduates, 2) a study of those students who dropped out of the internship this summer, and 3) continued pre- and post-assessment of student interns at all three levels by Boeing staff as part of continuous quality improvement.

INTRODUCTION

The Boeing Company recognizes the need for industry to be more actively involved in improving the education, skills, and employability of as much as 80 percent of our youth who will not receive a four-year college degree. As a result, Boeing has developed a workplace internship modeled after the nationally recognized Tech Prep initiative.

A Tech Prep program combines a high school and community college competency-based curriculum in applied academics and vocational-technical courses leading to an associate degree in technology. Students prepare for technical jobs in the workplace, as well as for continued education leading to advanced degrees. Successful students are expected to have a clear concept of manufacturing technology, particular manufacturing-related skills the day they enter the workforce, and be able to progress to higher levels of employment.

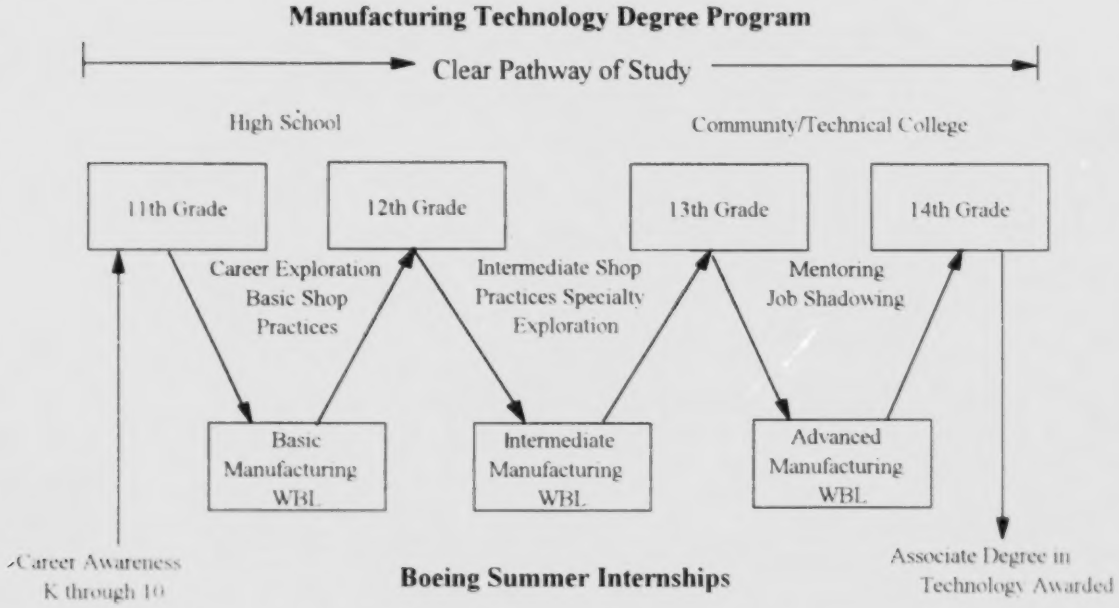
The Boeing Company's involvement in the Tech Prep program has been implemented in three phases. The initial phase helped build the applied academic foundation in Washington state's secondary school system. The second phase promoted the development of a statewide manufacturing technology degree program (within Tech Prep) and provided a work-based student internship program related to manufacturing technology. The third phase involves Boeing in a consortium with other manufacturing companies and educators in a statewide effort to develop manufacturing competencies and curriculum modules based on the needs of industry, and to involve other companies in Washington in expanding work-based learning opportunities for young people.

In February 1993, Boeing approved a summer internship program for students enrolled in a manufacturing technology program. This program provides students with three progressive internship levels offered in the summers of the 11th, 12th, and 13th grades (the first year of community college). The Internship Program is meant to accomplish the following objectives:

1. Introduce students to career opportunities in manufacturing technology
2. Teach basic manufacturing skills
3. Help develop workplace-basics skills
4. Help students plan for their future
5. Assist in high school drop-out prevention

The internships are coordinated with participating high schools and colleges to ensure that instruction complements students' academic courses. Each summer internship lasts four weeks for first- and second-year student interns, and six weeks for third-year student interns. All interns are paid. The first year internship focuses on the basics of manufacturing technology and provides students with an overview of career opportunities in this

area. (The first summer is hereafter referred to as the basic internship.) The second year internship (hereafter referred to as the intermediate internship) allows students to explore specific areas in manufacturing technology. The third year internship (hereafter referred to as the advanced internship) provides students with opportunities for job shadowing certain specialty areas in which they are interested, and prepares them for an associate degree in manufacturing technology. The figure below shows the path of a manufacturing technology degree program.



By the summer of 1996, over 200 students were participating annually in the Boeing Internship Program in the Seattle and Portland areas. In the summer of 1993, 25 students started the basic internship. In the summer of 1994, the same 25 students moved from the basic to the intermediate internship. An additional 75 students in the Seattle area and 12 in the Portland area began the basic internship. In the summer of 1995, 20 out of the 25 students who completed the basic and intermediate internships participated in the advanced internship. Sixty-four students in the Seattle area and nine in the Portland area moved from the basic to the intermediate internship. An additional 75 students in the Seattle area and 12 in the Portland area began the basic internship. The following table summarizes the number of Boeing student interns in the summers of 1993, 1994, and 1995 at different internship levels.

In 1996 there were an additional 75 students beginning the basic internship in Seattle. Sixty-nine moved into the intermediate internship, and 34 into the advanced level. In

Portland there were 11 in the basic internship, 11 in the intermediate, and 4 who continued into the advanced internship.

Table 1
Number of Boeing Interns During Summers 1993-1996

	1993	1994	1995	1996
Seattle				
Basic	25	75	75	75
Intermediate		25	64	69
Advanced			20	34
Portland				
Basic		12	12	11
Intermediate			9	11
Advanced				4
TOTAL	25	112	180	204

The focus of this report is the work-based Student Internship Program of summer 1996. Three groups of students from the Seattle and Portland areas participated in the program that summer. Data were collected in summer 1996 from 178 interns in Seattle and 26 in Portland. Pre- and post-summer surveys were used.

OVERVIEW OF EVALUATION PROCESS

Purpose

The Boeing Company contracted with the Northwest Regional Educational Laboratory (NWREL) to evaluate the Student Internship Program. The purpose of this evaluation is to: (1) describe comprehensively the operations and outcomes of the Internship Program, (2) provide information for continuous quality improvement of the Internship, (3) document the impact of the Internship on students and others, and (4) identify promising practices related to the Internship that could be adapted by others in business and industry interested in developing similar student internships.

Methodology

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The written surveys developed by NWREL consisted of pre- and post-surveys for each internship level: basic, intermediate, and advanced. Each set of pre- and post-surveys included questions on the following subjects:

- The amount of knowledge in the manufacturing competencies students had before and after their internship—for example, precision measuring—to be taught at the different levels (basic, intermediate, or advanced)
- Broader employability outcomes such as group participation, and educational and occupational plans
- Interns' assessments of the learning environments in their home high schools the previous year and during their internships
- The strengths and weaknesses interns perceived in the Internship Program and suggestions for improving it

FINDINGS

The findings in this report are organized around the levels of internship. Findings related to this year's internship are compared with the previous three-year findings whenever a trend is apparent.

Basic Internship

In summer 1996, a total of 86 students participated in the basic internship, 75 in the Seattle area and 11 in the Portland area. All students had just completed 11th grade. About 82 percent of the basic internship students were male and about three quarters were white. These 86 students were selected from 21 schools or school districts, 15 in Seattle and six in Portland. As in previous years, the data collected this year show that teachers continue to play a major role in recruiting student interns; counselors were also identified by about 20 percent of the students in Seattle. Parents were also very supportive of their children participating in the Internship Program.

Forty-eight students in the Seattle area and 11 students in the Portland area responded to both the pre- and post-surveys designed for the basic internship. Complete survey results are in Appendices A and B. The following sections summarize student findings regarding various aspects of the internship program.

Preparing for the Internship

A quarter of the students from the Seattle area and half from the Portland area indicated that the interview they had for admission into the Internship Program was their first job interview. The majority of the students (more than 95 percent) did not have problems with the interview questions.

Close to 90 percent of the survey respondents felt that the orientation was helpful while 7 percent were not sure, and 3 percent felt it wasn't helpful. Most students indicated that through this orientation they were able to understand what was expected of them during the internship including dress code, where to report, and dates and times for the internship.

When asked what they would recommend to improve the selection process, some students suggested the following:

- Shortening the interview
- Asking more specific questions
- Having more students and more school districts involved in the recruiting process

Work and Educational Plans

Over 60 percent of the respondents had weekend or after-school jobs; most of these jobs were non-technical or manual. When asked if they had any work plans after high school graduation, 67 percent of Seattle respondents and 73 percent of Portland respondents indicated "yes" in the pre-survey; in the post-survey, 70 percent of Seattle respondents and 92 percent of Portland respondents indicated "yes." Some specifically planned to work for Boeing. Although the number of students who had work plans after high school graduation increased after the Internship, there were no significant changes in the type of work they desired to do. About 20 percent of jobs listed by Seattle interns and 36 percent of Portland interns in the post-survey were related to manufacturing technology

Ninety-five percent of the respondents in the Seattle area and 73 percent in the Portland area indicated in the pre-survey that they had educational plans for after high school graduation. The overwhelming majority of them planned to continue their postsecondary education in two-year community colleges or technical/vocational schools in the Northwest, and a few planned to go to four-year colleges. In the Portland area, students had to agree to attend Mt. Hood Community College after their high school graduation to qualify for participation in the Boeing Internship Program.

Students' Self-Ratings on Ability to Learn Mathematics and Science, and to Write Well

In pre- and post-surveys student interns were asked to rate their abilities to learn mathematics and science, and to write well on a scale of "excellent," "good," "fair," and "poor." The overall self-ratings of the three areas on the post-survey were higher than ratings on the pre-survey. Compared with the pre-survey, the post-survey shows that more interns rated themselves "excellent" or "good" in the ability to learn mathematics and science, and to write well. Table 2 summarizes basic student interns' self-ratings in these areas. In the Seattle areas, students rated themselves significantly higher on their ability to write well on the post-survey compared with their self-rating on the pre-survey. On the post-survey, Portland-area students rated themselves significantly higher on their ability to learn math compared with their pre-survey ratings. No significant differences were found for other ratings between the pre-survey and post-survey.

Table 2
Basic Student Interns' Self-Ratings on Ability to Learn Mathematics and Science, and to Write Well

Seattle Area	% Good or Excellent	
	Pre	Post[1]
Math	61	NA
Science	83	NA
Writing	70	NA

Portland Area	% Good or Excellent	
	Pre	Post
Math	73	82
Science	91	100
Writing	64	82

[1]Self ratings in these three areas were not asked on the Seattle post-survey form used.

Basic Students' Self-Ratings on Knowledge of Internship Topics

Specific topics were selected by the Boeing Company for each level of student internship. Interns were assessed before and after the Internship as to what degree they knew the topics, "a lot," "some," "little," or "none." Tables 3 and 4 show the percentage of Seattle and Portland interns who indicated "a lot" or "some" on the pre- and post-surveys. Interns in 1996 at Auburn and Everett were inadvertently administered a different post-survey form that did not include these questions. However, in 1995 Seattle interns rated themselves significantly higher on the post-survey in 21 of the 28 areas rated. On the post-survey, 90 percent or more of the Seattle interns said that they knew "a lot" or "some" in 15 of the 28 areas rated. Only two areas (computer-aided design and budgeting money) has less than 75 of the interns indicating "a lot" or "some."

On the Portland post-survey, 90 percent or more of the interns indicated "a lot" or "some" on 23 of the 28 areas rated; 100 percent of the interns indicated "a lot" or "some" on 18 areas. Compared with their pre-survey ratings, Portland students rated themselves significantly higher on the post-survey in 12 of the 28 areas rated.

Table 3
Percentage of Seattle Basic Interns Reporting They Knew "a Lot" or "Some" Regarding Various Topics on the Pre- and Post-Surveys

(N = 73)[1]

	Three Sties[2]	Renton Only	
Topics	Pre	Pre	Post
"Just in time" production systems	16		94
Statistical process control	15		88
Tool design	30		97
Blueprint reading	40		99
Hazardous waste management/Hazardous materials	33		90
Continuous quality improvement	56		100
Manufacturing process	61		99
Manufacturing materials	49		94
Assembly lines	46		89
Manufacturing math/Trigonometry	42		86
World class competitiveness	50		82
Precision measuring	42		96
Shop practices	66		94
Computer-aided design	44		65
Diversity in the workplace	80		96
Shop safety	87		89
Team building/Working in teams	97		97
Importance of punctuality	88		86
Problem solving	95		92
Group participation	99		94
A sense of being part of a group	100		94
Budgeting time	88		85
Getting along with others	99		91
Getting up in time for work	96		88
Appropriate behavior/Workplace ethics	100		88
Budgeting money	87		73
Regular attendance at work	100		86
Preparing myself for work each day	96		79

[1] Interns at Auburn and Everett were inadvertently administered a different post-survey from that did not include these questions.

[2] Figures shown are percentages for 73 students.

Table 4
Number of Portland Basic Interns Reporting They Knew "a Lot" or "Some" Regarding Various Topics on the Pre- and Post-Surveys

(N = 11)

Topics	Pre	Post
"Just in time" production systems	4	11
Statistical process control	1	9
Tool design	4	9
Blueprint reading	3	9
Hazardous waste management/Hazardous materials	2	10
Continuous quality improvement	3	10
Manufacturing process	7	11
Manufacturing materials	6	11
Assembly lines	4	10
Manufacturing math/Trigonometry	5	11
Quality cost delivery system	1	10
Precision measuring	7	11
Shop practices	5	11
Computer-aided design	5	9
Diversity in the workplace	7	10
Shop safety	11	11
Team building/Working in teams	8	11
Importance of punctuality	10	11
Problem solving	10	11
Group participation	11	11
A sense of being a part of a group	11	11
Budgeting time	10	11
Getting along with others	11	11
Getting up on time for work	10	11
Appropriate behavior/Workplace ethics	11	11
Budgeting money	9	9
Regular attendance at work	11	11
Preparing myself for work each day	11	11

Learning Environment

One section of the survey asked students to rate on a 5-point scale ("strongly agree," "agree," "uncertain," "disagree," and "strongly disagree") the extent to which they agreed or disagreed with a number of positive statements about the learning environments in their high school or community college classes and in the Internship. This was to determine the comparative quality of the learning environment for the Boeing Internship. Other research

studies have shown that these learning environment characteristics are critical for effective understanding and retention of knowledge. Tables 5 and 6 show the comparisons. In general, both Portland and Seattle interns gave higher marks to their internship learning environment than to their high school learning environment. Portland interns gave higher marks to their high school learning environment than did Seattle interns.

In compiling the ratings they gave to their high schools, Seattle interns gave significantly higher marks to the Boeing Internship on every item relating to the learning environment. In contrast, Portland interns gave significantly high marks to the Boeing Internship on 5 of the 10 items rated.

Table 5
Percentage of Seattle Basic Interns Who Agreed or Strongly Agreed with Positive Statements Regarding the Learning Environment of Their Last Year's High School Classes and the 1995 Internship

(N = 73, 48)

Statement	1995 High School	1995 Internship[1]
Teachers/Boeing instructors helped me see the purposes for what I am learning	73	91
New information is connected to what I already know	84	93
The information to be learned is related to practical, real-life applications	76	93
The information in one class is related to what is being taught in other classes/ internship	49	89
Students are encouraged to use the knowledge gained to solve problems	90	92
Students work together as a team	82	93
Students have opportunities for hands-on learning	85	98
Courses/Information taught in an interesting manner	59	72
Teachers/Boeing staff showed that they really care about me	64	88
Teachers/instructors sometimes work together to plan or present the class (team teaching)	42	85

[1] A different post-survey form was inadvertently used in 1996 so that the comparative figures shown here are from the post-internship during the 1995 summer.

Table 6
Number of Portland Basic Interns Who Agreed or Strongly Agreed with Positive Statements Regarding the Learning Environment of Their Last Year's High School Classes and the 1996 Internship

(N = 11)

Statement	1995-96 High School	1996 Internship
Teachers/Boeing instructors helped me see the purposes for what I am learning	9	11
New information is connected to what I already know	10	11
The information to be learned is related to practical, real-life applications	7	11
The information in one class is related to what is being taught in other classes/ internship	4	9
Students are encouraged to use the knowledge gained to solve problems	9	11
Students work together as a team	10	11
Students have opportunities for hands-on learning	10	11
Courses/Information taught in an interesting manner	8	9
Teachers/Boeing staff showed that they really care about me	9	10
Teachers/instructors sometimes work together to plan or present the class (team teaching)	5	10

The majority of Portland interns (82 to 100 percent) at the end of the internship agreed or strongly agreed with other statements directly relating to their summer internship experience. This information is shown in Table 7. All interns agreed that "instructors trusted me as a responsible adult, learning can be fun, they discussed their internship experiences with family at least weekly; and the internship will help them with their future education." Likewise, all agreed that they would recommend the internship to friends.

Table 7
Number of Portland Basic Interns Who Agreed or Strongly Agreed with Positive Statements Following the Internship
(N=11)

Statement	Number
I feel that manufacturing would be an interesting career field	10
The instructors knew their subject content well	10
The instructors treated me as a responsible adult	11
Compared with my high school classes, I feel I was more successful as a learner at Boeing	10
Learning can be fun	11
I would recommend this internship to my friends	11
I generally discussed my internship experience with my parents/family at least weekly	11
This internship will help me with my future education	11
This internship will help me with my future employment	10
The Boeing staff sometimes made program changes on input from student interns	9

Basic Internship Strengths, Weaknesses, and Recommendations

Three open-ended questions in the post-survey asked interns to identify major strengths and weaknesses of the summer internship and to give recommendations for improving the Boeing internship for next year. Complete responses to these questions are shown in Appendices A and B.

Seattle area. The Seattle respondents most frequently identified the following as strengths of the basic internship:

- Working in teams and leaning how to get along well with others
- Information taught in a clear and interesting way
- Hands-on experience of various manufacturing skills

Weaknesses noted were:

- Problem staying awake
- Needed more hands-on activities

- Some speakers were boring
- Having to get up early every day for work

Changes suggested for 1997 included:

- Get more hands-on sessions
- Longer time for projects
- Some sessions could have been more interactive

Students were also asked what kind of things they planned to do during their next year of school to keep them focused on future career possibilities in manufacturing technology. The following is a list of actions most students planned to:

- Enroll in math, shop, computers, and applied courses
- Not go to high school but attend a technical college

Portland area. The major strengths of the basic internship identified most frequently by Portland interns included:

- Working with the Lab and learning how to run most of the machines
- The hands-on learning

The weaknesses of the summer internship included:

- Some presentations were boring
- Crammed too much information into one day

Changes suggested by Portland interns for 1997 included:

- Put more emphasis on hands-on experience and allow more opportunities for students to learn by doing
- Students need to have more time to absorb what they have learned
- Have students remain in small groups

Intermediate Internship

In the summer of 1996, a total of 80 students took the Boeing intermediate internship, 69 in the Seattle area and 11 in the Portland area. Of the 69 Seattle area interns, 24 were from the Renton plant, 23 from Everett, and 22 from Auburn. These interns had just graduated from their high schools before the summer internship. They had completed their basic internship in the summer of 1995. This section presents the results of pre- and post-surveys administered to this group of students before and at the end of the intermediate internship. Somewhat different forms were used in Portland and Seattle. Complete survey results are in Appendices C and D.

Work and Educational Plans

Eighty-two of Seattle respondents indicated on the pre-survey that they had educational plans after high school graduation. Most of them will continue their postsecondary education in two-year community colleges or technical/vocational schools.

When asked if they had any work plans after graduation, 82 percent of Seattle interns and 91 percent of the Portland interns indicated "yes" on the pre-survey. The percentages were the same on the post-survey. There were no significant changes in the type of work they planned to do before and after the summer internship. Although some indicated they would like to continue the Boeing Internship next year or look for manufacturing-related jobs, many planned to keep their current jobs to earn money for postsecondary education. Most of their current jobs were not directly related to manufacturing technology.

Students' Self-Ratings on Ability to Learn Mathematics and Science, and to Write Well

Intermediate interns were also asked to rate their ability to learn mathematics, science, and to write well on pre- and post-surveys on a scale of "excellent," "good," "fair," and "poor." No significant changes were found in Portland interns' pre-and post-ratings in these three areas. Approximately three-quarters of the Seattle interns rated their ability to learn these three areas as "excellent" or "good" on the pre-survey. This question was not asked on the post-survey.

Intermediate Interns' Self-Ratings on Knowledge of Various Topics Relating to Manufacturing Technology

Manufacturing technology topics addressed in the Seattle area and those addressed in the Portland area differed slightly for the intermediate internship. Portland interns reported

increased knowledge of these topics on the post-survey compared with their self-ratings on the pre-survey. Seattle did not include this item on the post survey.

In the Portland area, when compared with the pre-survey, students rated themselves the same or higher on all 12 items rated on the post-survey. There were two areas in which the greatest growth was noted: Resource management and Project alignment. In each case the number reported knowing "a lot" or "some" doubled from 5 to 10.

Table 8 summarizes the percentage of Portland interns who reported that they knew "a lot" or "some" about various topics relating to manufacturing technology on pre- and post-surveys.

Table 8
Number of Portland Intermediate Interns Reporting They Knew "a Lot" or "Some" Regarding Various Topics Skills on the Pre- and Post-Survey

(N =11)

Topics	Pre	Post
Manufacturing unit cost	10	11
Resource management and manufacturing	5	10
Numerical control	8	11
Project alignment	5	10
Project evaluation	10	11
Labor and industry relations	6	9
Numerical control programming	8	11
Group dynamics and communication	10	11
Customer relations	10	10
Customer satisfaction	11	11

Learning Environment

Regarding the learning environments in high school classes and the Internship, the survey results show that both Seattle and Portland interns gave the Internship higher marks on each statement. Seattle interns rated the learning environment of the Internship higher than their high schools on all aspects surveyed. Portland interns rated the learning environment of the Internship the same or higher on 9 of the 10 items rated. Data shown here from the prior year indicate that these questions were not asked in Seattle in 1996, therefore, we

have included data from 1995-96. The greatest difference noted was in more team teaching at Boeing than in the regular high schools. Tables 9 and 10 summarize the percentage of Seattle and Portland interns who agreed or strongly agreed with each of the positive statements regarding their last year's school classes and their 1996 summer internship.

Table 9
Percentage of Seattle Interns Reporting They Agreed or Strongly Agreed with Statements Regarding Last Year's High School Classes and 1995 Intermediate Internship[1]

(N = 69)

Statement	% 1995-96 High School	1995 Internship[1]
Teachers/Boeing instructors helped me see the purposes for what I am learning	64	95
New information is connected to what I already know	70	83
The information to be learned is related to practical, real-life applications	56	85
The information in one class is related to what is being taught in other classes/ internship	42	81
Students are encouraged to use the knowledge gained to solve problems	72	97
Students work together as a team	52	96
Students have opportunities for hands-on learning	69	97
Courses/Information taught in an interesting manner	52	75
Teachers/Boeing staff showed that they really care about me	48	81
Teachers/instructors sometimes work together to plan or present the class (team teaching)	45	87

[1] The Seattle Intermediate Internship Post Survey form in 1996 did not ask this question, and we present the 1995 intermediate responses as a base for comparison. Comparative ratings for regular high school for 1994-95 and 1995-96 were similar except for two areas in which the ratings improved by more than 10 percent ("students have opportunities for hands-on learning," which went 55 to 69 percent, and "courses were taught in an interesting manner," which went from 35 to 52 percent.)

Table 10
Number of Portland Interns Reporting They Agreed or Strongly Agreed with the Statements Regarding Last Year's High School Classes and 1996 Intermediate Internship

(N = 11)

Statement	1995-96 High School	1996 Internship
Teachers/ Boeing instructors helped me see the purposes for what I am learning	10	10
New information is connected to what I already know	9	10
The information to be learned is related to practical, real-life applications	11	9
The information in one class is related to what is being taught in other classes/ internship	7	9
Students are encouraged to use the knowledge gained to solve problems	9	11
Students work together as a team	10	10
Students have opportunities for hands-on learning	10	10
Courses/Information taught in an interesting manner	9	11
Teachers/Boeing staff showed that they really care about me	11	9
Teachers/instructors sometimes work together to plan or present the class (team teaching)	4	9

Intermediate Internship Strengths, Weaknesses, and Recommendations

Open-ended questions were included in the survey to have intermediate interns identify major strengths and weaknesses of their internship and make recommendations for improving the Internship Program for the following year.

Seattle area. The major strengths identified by the Seattle respondents are listed below. They are reported separately for Auburn and Renton in Appendix D. Everett interns were not administered the post-survey.

- Learning how to work in teams
- Learning various skills related to manufacturing technology and relevant to future education and employment

- The use of more hands-on activities

The major weakness identified by the Seattle respondents was:

- Too much sitting in the classroom

As for improvement, students recommended:

- Reduce class time and have more time for hands-on experiences
- Allow more time for certain projects when necessary
- Extend the length of the internship

In addition to recommendations, students were asked what kind of things might be done during their next year of school to keep them focused on future career possibilities in manufacturing technology. The most frequent plans were to:

- Work toward a degree in manufacturing in community colleges or four-year universities
- Take more classes related to manufacturing
- Look for opportunities of working in the area of manufacturing technology

Portland area. The major strengths identified by Portland interns included:

- Teamwork skills
- Various skills relating to manufacturing such as CNC programming

The major weakness identified was:

- Need for more shop time

Students recommended the following:

- More shop time

To keep focused on manufacturing after the summer internship, some students planned to:

- Take more classes related to the field
- Keep in touch with Boeing and look for more related working experience

Advanced Internship

A total of 34 students in the Seattle area and 4 in the Portland area took the advanced internship in the summer of 1996. This group of students took their basic internship in the summer of 1994 and their intermediate internship in the summer of 1995. They were the second group of students who graduated from the consecutive three-year summer Internship Program.

A pre-survey was completed by all 34 advanced interns in Seattle and 4 in Portland. The post-survey was completed by 26 in Seattle and 4 in Portland. Of the Seattle participants 13 were working at Auburn, 11 at Everett, 8 at Renton, and 2 at non-Boeing locations.

Pre- and Post-Surveys

Sixty-five percent of the 34 Seattle interns were attending a postsecondary institution when they entered their advanced internship; most of them were enrolled in community colleges. Seventy-four percent were employed at that time, and 56 percent of those employed worked full time. Only 12 percent of those employed indicated that they had some difficulty arranging with employers to be away from their current jobs for six weeks in order to participate in the Internship. According to the job titles students listed on the survey, only 5 were working on jobs related to manufacturing technology. Students' plans for future employment included 10 who specifically indicated wanting to work for the Boeing Company and another 6 who listed manufacturing-related jobs.

Responding to the question of what they expected to gain from the third-year summer internship experience, students included:

- Learning manufacturing skills
- Obtain a job at Boeing
- Obtaining more actual work experience
- Better understanding of available careers

At the beginning of the advanced internship, students were asked to what extent they knew about the topics to be covered during the summer. Table 11 shows the percentage of the respondents reporting that they knew "a lot," "some," "little," or "none" about these topics upon entry to the advanced internship. Over 40 percent felt they had "a lot" of knowledge about safety and health shop skills, and group dynamics and communications. These are the same areas in which there were the largest increases compared to the previous year's advanced intern responses. For example in 1995, 24 percent felt they entered the third year internship knowing a lot of about group dynamics and communication, and in 1996, that number rose to 42 percent.

By the end of the advanced internship, at least two-thirds of the interns felt they knew "a lot" about group dynamics and communication, safety and health, and shop skills. On the other hand, only 12 percent felt they knew "a lot" about business economics and resource management. These variations are logical in terms of the more critical skills needed in entry level positions in manufacturing technology.

Table 11
How Much Seattle Respondents Knew about Each Topic Related to Manufacturing Technology on Entry and Completion of the Advanced Internship

Topic		%			
		A Lot	Some	Little	None
Group dynamics and communication	Pre	42	52	6	0
	Post	85	15	0	0
Measurement	Pre	39	46	15	0
	Post	39	35	22	4
Safety and health	Pre	61	39	0	0
	Post	73	27	0	0
Quality assurance	Pre	21	61	18	0
	Post	54	42	4	0
Print interpretation	Pre	15	36	49	0
	Post	35	46	12	8
Shop skills	Pre	49	45	6	0
	Post	69	19	8	4
Business economics	Pre	12	58	30	0
	Post	35	42	23	0
Resource management and manufacturing computing	Pre	12	49	36	3
	Post	50	39	11	0
Product and process control	Pre	27	46	21	6
	Post	50	46	4	0
Labor and industry	Pre	18	55	24	3
	Post	42	31	19	8

Post-surveys used in Seattle and Portland collected interns' thoughts on the advanced internship's strengths, weaknesses and suggestions for improvement. These are contained in Appendices E and F and summarized below.

Among the most frequently mentioned strengths of the advanced internship reported by interns in Seattle and Portland were:

- the hands-on experiences
- career direction
- better idea of what Boeing offers and how it operates
- shop skills

The weaknesses most frequently mentioned by the advanced interns were:

- needed more time
- inadequate planning with supervisors in advance

The most commonly suggested improvements were:

- having a daily schedule for each intern
- start planning the internship earlier
- more blueprint interpretation

CROSS YEAR ANALYSIS

This section summarizes an analysis of findings across the three levels of the Boeing Student Internship Program. Two areas are covered: students' perceptions of their ability to learn academics, and changes in perceptions of their high school learning environment.

Ability to Learn Academics

An internship in manufacturing technology involves the need to apply not only technical skills but also academic skills. Because we did not have a common measure to assess actual growth in mathematics, writing, and science, we chose to assess students' self-perceptions of their abilities to learn these three areas; our hypothesis was that because students had these academic skills integrated with their hands-on learning, their self-perceptions of their abilities to learn them would improve.

Table 12 shows interns' ratings before the Internship, after completing the basic internship, and again after completing the advanced internship. We used only the Seattle interns for their comparison because there were too few Portland interns to make valid comparisons. As seen in Table 12, the percentage of interns who perceived they had excellent or good skills to learn writing increased from 70 to 100 percent over the three-year period. In mathematics, the percentage increased from 61 to 72, and in science the numbers remained stable ranging from 83 to 86 to 81 percent across the three-year period.

In interpreting these data, certain cautions need to be kept in mind: The three coherts reported are different groups of students; the numbers of interns decreases across the three years; and there may be an overall increase in the ability level of interns across the three years considering basic interns entered immediately after their junior year of high school while advanced interns had already completed one year of post-secondary education. Nevertheless, the increase in writing and academics across the three helps to support the value of integrated academics in the Boeing Internship.

Table 12
Self-Ratings on Ability to Learn Specific Academics at Various Points in the Three Year Internship: Seattle Interns

	Excellent	Good	Fair	Poor
WRITING				
Before internship	25	45	24	5
After basic	36	33	28	3
After advanced	50	50	0	0
MATHEMATICS				
Before internship	24	37	36	3
After basic	29	39	25	7
After advanced	35	42	15	8
SCIENCE				
Before Internship	26	57	16	1
After Basic	38	48	13	1
After Advanced	39	42	19	0

High School Learning Environment

Graduating seniors in the intermediate internship program in both Seattle and Portland were asked in the summer of 1995 and 1996 to rate their high schools as well as the Boeing Internship on a variety of instructional strategies used in both settings.

Table13 shows an increase over the past two years in opportunities for hands-on learning and courses taught in an interesting manner. These changes suggest an initial impact of Boeing support in the public schools for applied academics and integrated curriculum.

Table 13
Percentage of Intermediate Interns Who Agree or Strongly Agree with Selected Statements

Instructional Strategy	Seattle		Portland	
	1995	1996	1995	1996
Opportunities for hands-on learning	55	69	66	91
Courses taught in an interesting manner	35	52	55	82

APPENDIX A
BASIC INTERNSHIP PRE RESULTS FOR PORTLAND

(First Day)

(n = 11)

This survey is intended to give us some useful background about the students who are entering the Boeing Student Internship Program so that we can develop a relevant summer experience for you. The information will be held confidential and will not affect your selection or participation in the program. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

1. *How did you first learn about the internship? Check one of the following choices.*

   0 - Poster **6** - Teacher **0** - Counselor **1** - Fellow student
   2 - Internship coordinator
   1 - Other (specify):

   - Working in internship room for E-car

2. *Who encouraged you to apply? Check all that apply.*

   8 - Parents/Guardians **10** - Teacher **2** - Counselor **5** - Fellow student
   3 - Internship coordinator

3. *Who, if anyone, helped prepare you for the interview? Check all that apply.*

   0 - No one **9** - Teacher **5** - Counselor **6** - Parents/Guardians
   1 - Internship Coordinator
   2 - Other (specify):

   - School-to-Work Coordinator
   - Friend

4. *Was this your first job interview?*

   5 - Yes **6** - No

5. *Did you have any trouble with any of the interview questions?*

   0 - Yes **11** - No

6. *What would you recommend to improve the selection process of interns?*

   - I think you guys have a good selection process.

- To speed it up a little
- Not much, the people were friendly and it wasn't a stressed situation
- Have more questions that relate to real life situations so that you can learn more about the person
- Recommend more learning skills for us to learn more

7. *Do you have a summer job you are working at while you are attending the Boeing internship?*

6 - Yes **5** - No

If yes, how many hours per week are you working? **17.8** hours (mean)

8. *What were the main points you gained from the orientation?*

- I learned what we were going to do, and our different time frames.
- This is a learning experience.
- I learned a little more about the program and what we are going to be doing.
- Safety is very important.
- When the program would be, I learned much more at the Mt. Hood open house.
- First impressions. Act like an adult when at the company. Be responsible.
- You want team workers, hard workers, people you can count on.
- Working with tools and learning more about building.
- What we would focus on, goals to accomplish, pay rate.
- This is a learning opportunity and that we will be treated as if we worked here.

9. *Have you ever considered quitting school?*

0 - Yes **11** - No

10. *Do you have an after school weekend job?*

8 - Yes **3** - No

If yes, what are you doing?

- G&L Screw Machine Shop.
- Working at Safeway.
- Washing dishes.
- I work at a grocery store.
- Working a Tarret Lathe.
- Working at a nursery.
- Shift runner at Rockwood Domino's Pizza.
- I work at a hobby shop. Sometimes I mow lawns or assemble R.C. cars.

11. *You are* **10** - Male **1** - Female

12 *The summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Please check one answer for each topic.*

Topics	A Lot	Some	Little	None
Diversity in the workplace		7	2	2
Team Building/Working in teams	5	3	3	
Problem solving	3	7	1	
Importance of punctuality	7	3	1	
Manufacturing process	3	4	4	
Assembly lines	1	3	7	
Just in time production systems		4	2	5
Precision measuring	2	5	2	2
Manufacturing math/trigonometry	1	4	5	1
Blueprint reading		3	6	2
Manufacturing materials	1	5	4	1
Shop safety	5	6		
Shop practices	2	3	5	1
Quality cost delivery system		1	3	7
Computer aided design		5	3	3
Hazardous waste management/Hazardous materials		2	5	4
Tool design		4	4	3
Continuous quality improvement		3	3	5
Statistical process control		1	3	7
Getting up on time for work	9	1		
Regular attendance at work	10	1		
Group participation	10	1		
Getting along with others	11			
Appropriate behavior/Workplace ethics	10	1		
A sense of being a part of a group	10	1		
Budgeting time	8	2		
Budgeting money	7	2	2	
Preparing myself for work each day	8	3		
Concentrating on a task I'm doing	10	1		

13. *The following statements relate to the high school courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	SA	A	U	D	SD
A.	Teachers helped me see the purposes for what I was learning	2	7	1	1	
B.	New information was connected to what I already know	1	9	1		
C.	The information to be learned was related to practical, real-life applications	2	5	3	1	
D.	The information in one class was related to what was being taught in other classes		4	5	2	
E.	Students were encouraged to use the knowledge gained to solve problems	4	5	2		
F.	Students worked together as a team	3	7	1		
G.	Students had opportunities for hands-on learning	4	6	1		
H.	Courses were taught in an interesting manner	1	7	1	2	
I.	Teachers showed that they really care about me	3	6	2		
J.	Teachers sometimes worked together to plan or present the class (team teaching)	1	4	5	1	

14. *On what basis do you usually select what high school courses to take for the following year? Check all that apply.*

2 - It depends on the classes my friends are taking
0 - How easy the class is said to be
10 - How it fits into my future educational plans
11 - How it fits into my future work plans
9 - High school graduation requirements
6 - College entrance requirements
6 - Advice from a counselor
9 - Advice from a teacher
6 - Advice from parents/family
2 - Other (specify):

- Employer
- If it interests me

15 a. *Do you have any work plans after high school graduation?*

8 - Yes **3** - No

b. *If yes, what are your work plans?*

- To get money for college
- I am going to college
- Domino's delivery driver during MHCC, machinist after associate's degree
- To work for my girlfriend's step-dad laying carpet
- Manufacturing
- Continue working with my present employer
- Part-time summer jobs
- I hope to find a part-time manufacturing job to help put me through college

c. *Have you ever discussed these plans with your parents family?*

8 - Yes **1** - No

16. *What is your ethnic background? Circle one. If your ethnic background covers more than one of the specific choices provided below, please check "other" and specify.*

Asian or Pacific Islander	**1**
Hispanic, regardless of race	--
Black, not of Hispanic origin	--
White, not of Hispanic origin	**10**
American Indian or Alaskan Native	--
Other (specify)_____	--

17. *How would you rate your ability to learn mathematics?*

4 - Excellent **4** - Good **3** - Fair **0** - Poor

18. *How would you rate your ability to learn science?*

4 - Excellent **6** - Good **1** - Fair **0** - Poor

19. *How would you rate your ability to learn to write well?*

1 - Excellent **6** - Good **4** - Fair **0** - Poor

20. *Did your high school mail you or your parents any information about the internship program to your home?*

5 - Yes **6** - No

BASIC INTERNSHIP POST RESULTS FOR PORTLAND (LAST WEEK)

(n = 11)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

1. *On what basis did you select courses for next school year? Check all that apply.*

0 - It depended on the classes my friends were taking
0 - How easy the class was said to be
8 - How it fits into my future educational plans
8 - How it fits into my future work plans
9 - High school graduation requirements
5 - College entrance requirements
4 - Advice from a counselor
7 - Advice from a teacher
4 - Advice from parents/family
1 - Other (specify):

- If it broadens my knowledge.
- Employer.

2. a. *Do you have any work plans after high school graduation?*

8 - Yes **2** - No

b. *If yes, what are your work plans?*

- Working a part-time job
- Delivery driver
- Continue working for present employer
- Find a job to put me through school
- Hobby shop
- To finish Tech Prep
- Work in a machine shop to help pay for college (2)

c. *Have you ever discussed these plans with your parents family?*

8 - Yes **0** - No

3. *The summer internship is designed to teach you about topics such as those listed below. How much have you learned through this summer internship? Please check one answer for each topic.*

Topics	A Lot	Some	Little	None
Diversity in the workplace	6	4	1	
Team building/Working in teams	11			
Problem solving	10	1		
Importance of punctuality	10	1		
Manufacturing process	10	1		
Assembly lines	5	5	1	
Just in time production systems	6	5		
Precision measuring	10	1		
Manufacturing math/Trigonometry	10	1		
Blueprint reading	4	5	2	
Manufacturing materials	3	8		
Shop safety	11			
Shop practices	10	1		
Quality cost delivery system	4	6	1	
Computer aided design	5	4		1
Hazardous waste management/Hazardous materials	5	5	1	
Tool design	4	5	2	
Continuous quality improvement	8	2	1	
Statistical process control	3	6	2	
Getting up on time for work	9	2		
Regular attendance at work	10	1		
Group participation	11			
Getting along with others	10	1		
Appropriate behavior/Workplace ethics	11			
A sense of being a part of a group	11			
Budgeting time	9	2		
Budgeting money	6	3	2	
Preparing myself for work each day	9	2		
Concentrating on a task I'm doing	11			

4 *How would you rate your ability to learn mathematics?*

4 - Excellent **5** - Good **2** - Fair **0** - Poor

5. *How would you rate your ability to learn science?*

6 - Excellent **5** - Good **0** - Fair **0** - Poor

6. *The following statements relate to your summer Boeing Internship. For each statement listed below please circle one of the following ratings: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	SA	A	U	D	SD
A.	The Boeing instructors helped me see the purposes for what I was learning	7	4			
B.	New information was connected to what I already know	5	6			
C.	The information to be learned was related to practical, real-life applications	8	3			
D.	The information in one class was related to what was being taught later in the internship	6	3	2		
E.	Students were encouraged to use the knowledge gained to solve problems	8	3			
F.	Students worked together as a team	9	2			
G.	Students had opportunities for hands-on learning	9	2			
H.	Courses were taught in an interesting manner	3	6	1	1	
I.	The Boeing staff showed that they really care about me	6	4	1		
J.	The instructors sometimes worked together to plan or present the class (team teaching)	4	6	1		
K.	I feel that manufacturing would be an interesting career field	7	3	1		
L.	The instructors knew their subject content well	7	3	1		
M.	The instructors treated me as a responsible adult	8	3			
N.	Compared to my high school classes, I feel that I was more successful as a learner at Boeing	8	2	1		
O.	Learning can be fun	8	3			
P.	I would recommend this internship to my friends	11				
R.	I generally discussed my internship experiences with my parents/family at least weekly	9	2			
S.	This internship will help me with my future education	8	3			
T.	This internship will help me with my future employment	7	3	1		
U.	The Boeing staff sometimes made program changes based on input from students interns	6	3	2		

7. *How would you rate your ability to learn to write well?*

2 - Excellent **7** - Good **2** - Fair **0** - Poor

8. *What were the major strengths of your Boeing summer internship?*

- I learned all about Boeing's manufacturing process.
- Working in the lab was my major strength in the internship.
- It gave people away to learn such as hands-on. They also made it fun to learn. Everyone was neat and interesting.
- Working in lab, learning how to plan out things and to know about manufacturing.
- Teamwork and being precise.
- They threw a lot of concepts at us but the ones I picked up on the best were following instructions, working safely, and teamwork.
- The hands-on stuff.
- Keeping boring subjects interesting, skills we just learned and being able to apply them to work in the lab.
- Hands-on learning, interesting material, applied learning.
- Appropriate and analogous practice provided for the concepts taught in the classroom.
- Learning how to run most of the machines.

9. *What were the weaknesses of your internship?*

- In the classroom for too many days in a row.
- There was, sometimes, a too lengthy string of concepts taught without student feedback or immediate practice.
- Too much lecture time, not enough hands-on time.
- Crammed too much information in one day.
- Trying to be taught 100 things at once.
- Some of the organization was mixed up.
- See more of the plant to get a better idea of how manufacturing works.
- A little bit in math.
- There were times when the speakers got very boring and put some people to sleep, so classes were close together.
- Getting up and concentrating on the early speakers.
- Some of the presentations were boring.

10. *What changes would you suggest for improving the Boeing Internship for next year?*

- Get the presenters to do more hands-on activities.
- Mare activities for the mornings to get people more awake.
- Limit the class time, more time in the shop.
- Should have had work in the shop mixed with work in the class.
- A little more shop time, make everybody keep about the same area in their work.
- More hands-on experience.

- In the subjects that we go into real deep, spread out the information over a few days if possible.
- More condensed lectures, i.e., more of a general overview rather than very specific details, definitely more lab/shop time.
- Continued and increased public school teacher participation in, at least, the first year student program.
- Remain in small groups.

11. *What kind of things might be done during your next year of school to keep you focused on future career possibilities in manufacturing technology?*

- Regular visits to the Boeing plant, mentorship connections, a monthly newsletter mailed to students from MHCC/Boeing.
- Continued correspondence with Boeing/Tech Prep.
- More exciting tours.
- Math, metals.
- Math and shop classes.
- Take math classes and lab classes and computer class.
- Having mentors.
- Have Boeing give us updates on what's going on in technology.
- Take manufacturing.

APPENDIX B
INTERMEDIATE INTERNSHIP PRE RESULTS FOR SEATTLE

(First Day)

(n = 69)

This survey is intended to give us some useful background about the students who are entering the second year of the Boeing Student Internship Program The information will be held confidential and will not affect your participation in the program. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

Site: **24** - Renton
23 - Everett
22 - Auburn

1. *Was the parent student internship orientation on May 14th helpful to you? Check one of the choices below.*

11% - Very Helpful **26%** - Helpful **29%** - Somewhat Helpful **3%** - Not Helpful
31% - Don't Know

2. *What were the most useful parts of the orientation? Select one or more.*

13% - Learning about the college credits for the internship
6% - The opportunity to see friends
20% - The information about community/technical colleges involved in manufacturing technology
7% - Overview of the second year internship curriculum
13% - Other (specify):

AUBURN
- Filling out paperwork

EVERETT
- Good for questions about what to do first day (where, when, etc.) (3)
- Paperwork

3. *What do you expect to gain from your second year summer internship experience?*

AUBURN
- More knowledge in availability of fields or jobs in Boeing (4)

- More training. Further my skills in manufacturing.
- How to make a [?] and sell it to a company
- Money and education (2)
- Useful experience for a career in the electronics profession (2)
- I expect to learn more in-depth about the subjects we are studying
- I want to learn more about AP and some more about ANC operation
- More in-depth experience with the computers and more shop work
- Future goal or career choice
- Better knowledge of Boeing and its workings
- More in-depth training, and an excellent experience
- To get a better knowledge of fields that I would like to enter
- A greater depth of knowledge concerning last year's curriculum
- A better understanding of manufacturing technology (3)
- More in-depth views of the classes and shop information to help me decide on a job shadow

EVERETT

- More skills, knowledge learned (3)
- More knowledge into a technology degree
- Jobs throughout factory pros/cons of jobs
- More detailed and in-depth education, skills from what we learned in 1st year (4)
- A better understanding about manufacturing and how some of the tasks performed at Boeing and other technical businesses are accomplished
- A better understanding of the manufacturing world (2)
- A good dependable job to fall back on for third year
- Learn more about manufacturing and what jobs there are
- Proper procedure for some things
- More about Boeing and manufacturing
- More advanced technology and manufacturing skills (3)
- Work in shop experience. Understanding of what job I'd like to do or "job shadow"
- More hands on experience and more about the Boeing company and their goals
- Comfort on the job
- More understanding

RENTON

- I expect to gain knowledge about how the Boeing company works, and get more familiar with the manufacturing environment (2)
- More hands-on experience. Opportunity for full-time job at Boeing
- More experience in technical fields (3)
- I would like to narrow down the field that I want to study in college
- More knowledge relating to the manufacturing field
- Having fun working in the shop area (2)

- More knowledge with computers and what it takes to make quality technology
- To gain working knowledge in how a factory operates
- Leadership skills, team skills, manufacturing and the business end of it
- Experience and useful skills (2)
- More education in the manufacturing world
- Confidence in my work, ethics, and abilities
- Experience in manufacturing and teamwork skills
- Lots of knowledge on how planes are built from ground up
- A lot more work related problem solving
- More working skills, ability to learn more than last year
- More hands on experience and training working with others
- More insight to possible career choices (2)

4. *You are:* **81%** - Male **19%** - Female

5. *The second year summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Please check one answer for each topic.*

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
Labor and industry relations	9	58	28	6
Resource management and manufacturing	15	54	28	4
Group dynamics and communication	46	39	13	1
Customer relations	36	48	15	1
Project alignment	22	36	30	12
Blueprint interpretation	33	51	15	1
Numerical control	10	44	36	10
Optics in manufacturing	28	32	20	20
Manufacturing unit cost	13	38	36	13
Project evaluation	17	52	28	3
Customer buy-off	18	50	22	10

6. *The following questions relate to the high school courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

STATEMENT	% SA	A	U	D	SD
A. Teachers helped me see the purposes for what I was learning	12	52	18	15	4
B. New information was connected to what I already know	10	60	13	12	4
C. The information to be learned was related to practical, real-life applications	16	40	18	22	4
D. The information in one class was related to what was being taught in other classes	7	35	19	27	12
E. Students were encouraged to use the knowledge gained to solve problems	16	56	13	10	4
F. Students worked together as a team	24	28	18	25	6
G. Students had opportunities for hands-on learning	26	43	2	25	5
H. Courses were taught in an interesting manner	9	43	15	15	19
I. Teachers showed that they really cared about me	16	32	27	16	9
J. Teachers sometimes worked together to plan or present the class	7	38	29	19	6

7. a *Do you have any education plans after high school graduation?*

97% - Yes **3%** - No

b. *If yes, what are your educational plans?*

AUBURN

- College
- Marines
- To go to a 2-year school
- College degree in mechanical field
- Community college (5)
- Go to Bates for 2 years then to a University for electrical engineering
- A 2-year manufacturing engineering degree from a community college
- I would like to be the Aircraft mechanic

- To go to college and study on the career choice I'm looking into
- Army
- Go to an electronics school
- 2-year Associates in engineering, then transfer to a 4-year
- Attend P.L.V.
- Washington State University (2)
- Whatcom Community College or Western Washington University

EVERETT

- Community college (10)
- College (7)
- Community college, possibly the Navy
- Community college to get manufacturing degree
- Navy
- Technical school in Phoenix, Arizona
- Community or technical college
- Marine Corps

RENTON

- Attend a 2-year college
- Attend 2-year community college then transfer to a university (2)
- Washington State University (2)
- Attend Community College (10)
- Howard University
- I plan to go to Shoreline Community College and work towards an AA following Technology prep guidelines.
- College
- Attend a Technical College (2)
- Community College or Technical College

c. *Have you ever discussed these plans with your parents family?*

94% - Yes **6%** - No

8. a. *Do you have any work plans after high school graduation?*

82% - Yes **18%** - No

b. *If yes, what are your work plans?*

AUBURN

- Part-time
- Marines/Boeing
- Work for U.P.S.
- Work

- Something in electrical work
- Work at current job
- Boeing or other manufacturing plant
- I'll work 40+ hours
- To always keep a job
- Do the internship and attend Pierce for 2 years, then try to get a job with Boeing
- Army
- Part-time
- I would like to try and get a $10/hr job in Provo, Utah at a shop.
- Boeing Technical prep
- Working weekends at Toys R Us. Also taking College classes at night
- Receptionist part-time, referee

EVERETT

- Get a job in manufacturing
- To get a good paying job
- Work
- Working at Giddens for a while longer
- Work to help pay for college
- Safeway
- Navy
- Summer job
- Work with Chevron
- Work at Boeing
- Boeing
- Part-time job
- To maybe hide at Boeing after 3rd year
- Boeing internship
- Second year at Boeing and a roofing job

RENTON

- Continue working at part-time job
- Attain a full-time job to pay for college
- Boeing technology prep
- Boeing and Cape Cod
- King County Animal Control
- Work part-time (2)
- Working for UHAUL
- Part-time for Cinaplex Odeon
- Work in a grocery store
- Find a better job than McDonald's
- Boeing internship and Schucks Auto Parts

- I work for Ameriflight at Boeing Field
- Work as a freshman to earn money for school
- Managing an espresso stand
- Full-time or part-time job through college (2)
- Probably working way through some school

c. *Have you ever discussed these plans with your parents family?*

91% - Yes **9%** - No

9. *What is your ethnic background? Circle one. If your ethnic background covers more than one of the specific choices provided below, please check "other" and specify.*

Asian or Pacific Islander	**8%**
Hispanic, regardless of race	**3%**
Black, not of Hispanic origin	**4%**
White, not of Hispanic origin	**49%**
American Indian or Alaskan Native	**6%**
Other (specify)	**66%**

10. *How would you rate your ability to learn mathematics?*

29% - Excellent **39%** - Good **25%** - Fair **7%** - Poor

11. *How would you rate your ability to learn science?*

38% - Excellent **48%** - Good **13%** - Fair **1%** - Poor

12. *How would you rate your ability to learn to write well?*

36% - Excellent **33%** - Good **28%** - Fair **3%** - Poor

BASIC INTERNSHIP POST RESULTS FOR SEATTLE (LAST WEEK)

(n = 48)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

Note: Because Everett students were given a different survey than students at Renton and Auburn, data from Everett is reported at the end of this survey.

AUBURN: No data
RENTON: **23**

1. *The summer internship was designed to teach you about topics such as those listed below. How much do you know <u>now</u> about each of the following topics?*

Topics	A Lot	Some	Little	None
Diversity in the workplace	16	4	3	
Team building/working in teams	19	2	2	
Problem solving	12	11		
Importance of punctuality	16	5	2	
Manufacturing process	14	8	1	
Assembly lines	11	10	2	
"Just in time" production systems	11	10	1	1
Precision measuring	13	8	1	1
Manufacturing math/trigonometry	12	10	1	
Blueprint reading	11	9	3	
Manufacturing materials	9	11	2	1
Shop safety	18	3	1	1
Shop practices	14	7	1	1
Composites	10	11	2	
Computer aided design	8	8	6	1
Hazardous waste management/hazardous materials	9	13	1	
Electrical wire bundle build-up	6	10	7	
Continuous quality improvement	11	6	6	
Statistical process control	8	8	5	2

Topics	A Lot	Some	Little	None
Getting up on time for work	20		2	1
Regular attendance at work	20		1	2
Group participation	18	3	2	
Getting along with others	18	4		1
Appropriate behavior/workplace ethics	19	2	2	
A sense of being a part of a group	17	5		
Budgeting time	13	7	2	1
Budgeting money	7	8	5	3
Preparing myself for work each day	15	4	3	1

2 *The following statements relate to your summer Boeing internship. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

STATEMENT	SA	A	U	D	SD
A. The Boeing instructors helped me see the purposes for what I was learning	12	9	2		
B. New information was connected to what I already know	13	6	1	3	
C. The information learned was related to practical, real-life applications	9	12	1	1	
D. The information in one class was related to what was taught later in the internship	9	10	4		
E. Students were encouraged to use the knowledge gained to solve problems	11	6	4	1	
F. Students worked together as a team	14	6	2		1
G. Students had opportunities for hands-on learning	17	5			1
H. Information was taught in an interesting manner	6	12	3	2	
I. The staff showed that they really care about me	11	9	3		
J. Instructors sometimes worked together to plan or present the class (team teaching)	9	13	1		
K. I feel that manufacturing would be an interesting career field	8	4	10	1	
L. The instructors knew their content well	7	13	2		1
M. The instructors treated me as a responsible adult	11	8	3	1	

STATEMENT	SA	A	U	D	SD
N. Compared to my high school classes, I feel that I was more successful as a learner at Boeing	9	9	5		
O. I look forward to continuing as an intern in future years	13	8	2		
P. I now look on *learning* as my job	6	15	1	1	
Q. Learning can be fun	8	12	3		
R. I would recommend this internship to my friends	7	12	4		
S. I generally discussed my internship experiences with my parents/friends at least weekly	8	11	4		
T. This internship will help me with my future employment	15	7	1		
U. This internship will help me with my future education	12	10	1		
V. The Boeing staff made program changes based on input from me and other students	11	12			

3. *What were the major strengths of your Boeing summer internship?*

RENTON

- Projects, group activities, and eating
- Listening, paying attention
- It would have to be the teachings because it really gave me a sense of how manufacturing is
- I've learned a lot, team building and communication helped
- Teamwork, manufacturing material
- Getting the hands-on experiences
- Group work
- To help the students learn manufacturing
- Responsibility, accountability, and working with many types of people
- Teamwork, getting to meet a lot of new people
- I gained more knowledge and worked with other people
- Learning a lot
- Getting to work in teams and applying the work to the shop
- Precision measurement, blueprint reading, attendance
- A good job. I learned a lot. Good on resume
- Some strengths were the hands-on and shop learning
- Money, education, a lot of fun
- The math, precision measuring, shop
- The information taught was very clear and taught in an interesting manner
- Interesting, fun, taught me a lot
- My technology skills helped a lot
- Attendance, trying to make it

- I learned to become one with a team of strangers and become friends

4. *What were the weaknesses of your Boeing internship?*

RENTON

- Teachers, math, final project
- Hands-on
- Math
- Lessons seemed to last forever. Couldn't stay awake sometimes
- Lack of knowledge
- Many of the students voiced their opinion that they were bored with what I thought was an interesting lecture.
- Getting up so early!
- Other than needing more "hands-on" projects, none
- Getting my point across
- Staying awake
- The teamwork
- Classmates were a bunch of whiners
- Having confidence that I could do things
- Sometimes I just have to learn to get along with other people and not always think I am right.
- I'm quiet
- Sometimes boring. Really early!

5. *What changes would you suggest to improve the Boeing internship for next year?*

RENTON

- Longer time for projects
- More applicable topics in real life
- Shorter lessons, even more hands-on
- Check the interns "background" in manufacturing to see if they really are qualified
- Less standing up
- More shop time
- Calming the rules
- Some of the presentations could have been more interactive
- All the stuff in our process check
- Better pick for precision measuring
- During the clean up each person should have [been doing] a certain job
- Get more hands-on sessions
- Swivel chairs
- See the 777/747 production line
- Nothing, it was really nice except lose Randy Wilson
- Everything was great! I enjoyed it
- More hands-on. Pay us more. Teamwork

55

6. *Based on your Boeing internship what changes would you like to see in how your high school operates?*

RENTON

- Do more math, different skills
- More hands-on, more student participation
- Treat us with more responsibility
- Basically everything I have seen in here
- Teach fun stuff in school. Make people want to learn.
- I think they should teach more hands-on and teach what we will need for future jobs.
- The students
- More projects, hands-on learning
- Apply the work to the working environment
- More job oriented classes

7. *What kinds of things might be done during your next year of school to keep you focused on future career possibilities in manufacturing technology?*

RENTON

- Math, taking classes for future
- Getting more and more math skills
- No more long tours
- No fun at all
- Take another tech class
- Shop, applied classes
- Not go to high school but attend a vocational college instead
- Applying for college and looking forward
- It's pretty good as is
- The classes that I'll be taking and the college that I choose
- Take classes like Principles of Technology
- I am still undecided
- My homework and more math

EVERETT
n = 25

1. *The summer internship was designed to teach you about topics such as those listed below. How much do you know NOW about each of the following topics?*

Topic	A Lot	Some	Little	None
Corporate citizenship	13	11	1	
Team building	22	3		
What is manufacturing?	14	9	2	
CQI: Continuous quality improvement	23	2		
"Just in time"	8	11	3	3
Electronic/Soldering theory	5	5	12	3
Hazardous materials	22	2	1	
CATIA	19	6		
Blueprint reading	13	7	3	2
Composites	20	5		
Applied math/Trigonometry	11	10	4	
Precision measurement	21	3		
Statistical process control	12	12		1
Shop safety	8	9	6	2
Shop skills	23	2		

APPENDIX C
INTERMEDIATE INTERNSHIP PRE RESULTS FOR PORTLAND

(First Day)

(n = 11)

This survey is intended to give us some useful background about the students who are entering the second year of the Boeing Student Internship Program The information will be held confidential and will not affect your participation in the program. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

1. What is your ethnic background? *Circle one. If your ethnic background covers more than one of the specific choices provided below, please circle "other" and specify.*

Asian or Pacific Islander	0
Hispanic, regardless of race	1
Black, not of Hispanic origin	1
White, not of Hispanic origin	7
American Indian or Alaskan Native	1
Other (specify) _____	1

2. *What do you expect to gain from your second year summer internship experience?*

- To gain more information and get done with the project that I will start
- To learn more of how I could blend in if I were to get a job at Boeing Experience the expectations in Boeing workplace
- Teamwork, knowledge of machining
- I expect to gain knowledge in the areas of machining, math, teamwork and accuracy. I hope to experience more hands-on work.
- More knowledge about the machining industry
- I would like to learn more about CNC, milling machine, math.
- Some indepth knowledge of what the operators actually go through during an eight hour day, so I would like to job shadow.
- Hopefully I expect to gain more hands-on experience.
- More indepth education, hands-on
- To learn more about machines and be prepared for next year's classes. Decide what other classes to take in college.
- More knowledge, prep me for college, better my life

3. *The second year summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Check one answer for each topic.*

Topics	A Lot	Some	Little	None
Labor and industry relations	1	5	5	
Resource management and manufacturing		5	6	
Group dynamics and communication	4	6	1	
Customer relations	3	7	1	
Project alignment		5	5	1
Blueprint interpretation	3	4	4	
Numerical control programming	2	6	3	
Manufacturing planning	1	6	4	
Manufacturing unit cost	6	4	1	
Project evaluation	3	7	1	
Customer satisfaction	5	6		
Numerical control	1	6	4	

4. *The following questions relate to the high school courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

STATEMENT	SA	A	U	D	SD
A. Teachers helped me see the purposes for what I was learning	4	6		1	
B. New information was connected to what I already know	3	6	1	1	
C. The information to be learned was related to practical, real-life applications	6	5			
D. The information in one class was related to what was being taught in other classes	1	6	2	2	
E. Students were encouraged to use the knowledge gained to solve problems	3	6	1	1	
F. Students worked together as a team	6	4			1
G. Students had opportunities for hands-on learning	4	6		1	
H. Courses were taught in an interesting manner	2	7		1	1
I. Teachers showed that they really cared about me	4	7			
J. Teachers sometimes worked together to plan or present the class	2	2	4	3	

5. *You are* **9** - Male **2** - Female

6. a. *Do you have any work plans after high school graduation?*

10 - Yes **1** - No

b. *If yes, what are your work plans?*

- To go college and get a decent job
- I have a job
- Go to prep tech, follow through with college, then work at Boeing
- I want to get a job in machining area
- Internship at Boeing, college, then machinist job
- Get a job in an auto shop
- Finish internship (college)
- I have part-time work at UPS, stay with them
- Texaco
- U.S. Army Corps of Engineers

c. *Have you ever discussed these plans with your parents family?*

11 - Yes **0** - No

7. *Do you have a summer job?* **10** - Yes **1** - No

If yes, how many hours per week? **35** hours (mean)

8. *How would you rate your ability to learn mathematics?*

3 - Excellent **5** - Good **3** - Fair **0** - Poor

9. *How would you rate your ability to learn science?*

6 - Excellent **4** - Good **1** - Fair **0** - Poor

10. *How would you rate your ability to learn to write well?*

5 - Excellent **5** - Good **1** - Fair **0** - Poor

INTERMEDIATE INTERNSHIP POST RESULTS FOR PORTLAND

(Last Week)

(n = 11)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

1. *The second year summer internship was designed to teach you about topics such as those listed below. How much have your learned through this summer internship? Check one answer for each topic.*

Topics	A Lot	Some	Little	None
Labor and industry relations	2	7	2	
Resource management and manufacturing	6	4	1	
Group dynamics and communication	10	1		
Customer relations	9	1		
Project alignment	5	5		
Blueprint interpretation	6	5		
Numerical control programming	5	6		
Manufacturing planning	6	5		
Manufacturing unit cost	4	7		
Project evaluation	8	3		
Customer satisfaction	10	1		
Numerical control	5	5		

2. a. *Do you have any work plans after high school graduation?*

10 - Yes **1** - No

b. *If yes, what are your work plans?*

- To finish internship at Boeing
- Machinist and then computer integrated manufacturing
- Work while at college, student (3)

- Get a job (2)
- US Army Corps of Engineers
- Boeing
- Try to get a job in machine shop

c. *Have you ever discussed these plans with your parents family?*

10 - Yes **1** - No

3. *The following questions relate to your summer Boeing internship. For each of the statements listed below please circle one of the following ratings: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	SA	A	U	D	SD
A.	The Boeing instructors helped me see the purposes for what I was learning	6	5			
B.	New information was connected to what I already know	3	7		1	
C.	The information to be learned was related to practical, real-life applications	5	4	1	1	
D.	The information in one class was related to what was being taught later in the internship	5	4	2		
E.	Students were encouraged to use the knowledge gained to solve problems	7	4			
F.	Students worked together as a team	8	2	1		
G.	Students had opportunities for hands-on learning	7	3			
H.	Courses were taught in an interesting manner	4	7			
I.	The Boeing staff showed that they really care about me	5	4	2		
J.	The instructors sometimes worked together to plan or present the class (team teaching)	7	2	2		
K.	I feel that manufacturing would be an interesting career field	7	3	1		
L.	The instructors knew their subject content well	6	4	1		
M.	The instructors treated me as a responsible adult	3	3	3		1
N.	Compared to my high school classes, I feel that I was more successful as a learner at Boeing	5	4	2		
O.	Learning can be fun	5	6			
P.	I would recommend this internship to my friends	8	3			
R.	I generally discussed my internship experiences with my parents/family at least weekly	5	5	1		
S.	This internship will help me with my future education	9	2			
T.	This internship will help me with my future employment	9	2			
U.	The Boeing staff sometimes made program changes based on input from students interns	4	5	2		

4. *How would you rate your ability to learn mathematics?*

3 - Excellent **4** - Good **4** - Fair **0** - Poor

5. *How would you rate your ability to learn science?*

7 - Excellent **3** - Good **1** - Fair **0** - Poor

6. *How would you rate your ability to learn to write well?*

3 - Excellent **6** - Good **2** - Fair **0** - Poor

7. *What were the major strengths of your Boeing summer internship?*

- The final project. It helped students learn how to work together and how to please the customer.
- CNC, teamwork, staying awake
- The major strengths were working as teams, learning about manufacturing and customer relations.
- Math projects
- CNC programming and writing a plan
- It was more indepth than last year. There was more of a hands-on, tied to real life situations.
- Learning how to read precise measuring tools
- Using math skills, planning, and machining
- Working on blueprint and working our maller machine
- CNC programming, planning, shop skills

8. *What were the weaknesses of your Boeing internship?*

- The weaknesses were math and some lectures given.
- Solving morale problems, it was kind of hard for people to understand me. I think I know now.
- Communication (not being understood correctly). Generally I feel I gained a basic understanding of everything.
- Staying awake
- Learning the names of tools
- The mathematics, but with help from the instructor it wasn't too hard.

9. *What changes would you suggest for improving the Boeing internship for next year?*

- More shop time and projects
- Spend more time on morale
- More interactions with other interns at Boeing
- I would recommend adding more life to the lectures to keep people awake
- Realize intern (students) are not experienced machinists and need to be led through the process

- More shop time
- More pay, more hands-on
- Work in the shop a little longer

10. *What kind of things might be done during your next year of school to keep you focused on future career possibilities in manufacturing technology?*

- Sticking with Boeing internship program and going to college
- Nothing, it's all up to me.
- Connection days, etc.
- Other internships
- Take classes that pertain to it
- Take classes that involve my future careers
- Connecting days with Boeing every once in a while
- More hands-on

APPENDIX D
INTERMEDIATE INTERNSHIP PRE RESULTS FOR SEATTLE

(First Day)

(n = 69)

This survey is intended to give us some useful background about the students who are entering the second year of the Boeing Student Internship Program The information will be held confidential and will not affect your participation in the program. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

Site: **24** - Renton
23 - Everett
22 - Auburn

1. *Was the parent student internship orientation on May 14th helpful to you? Check one of the choices below.*

11% - Very Helpful **26%** - Helpful **29%** - Somewhat Helpful **3%** - Not Helpful
31% - Don't Know

2. *What were the most useful parts of the orientation? Select one or more.*

13% - Learning about the college credits for the internship
6% - The opportunity to see friends
20% - The information about community/technical colleges involved in manufacturing technology
7% - Overview of the second year internship curriculum
13% - Other (specify):

AUBURN
- Filling out paperwork

EVERETT
- Good for questions about what to do first day (where, when, etc.) (3)
- Paperwork

3. *What do you expect to gain from your second year summer internship experience?*

AUBURN
- More knowledge in availability of fields or jobs in Boeing (4)

- More training. Further my skills in manufacturing
- How to make a [?] and sell it to a company
- Money and education (2)
- Useful experience for a career in the electronics profession (2)
- I expect to learn more in-depth about the subjects we are studying
- I want to learn more about AP and some more about ANC operation
- More in-depth experience with the computers and more shop work
- Future goal or career choice
- Better knowledge of Boeing and its workings
- More in-depth training, and an excellent experience
- To get a better knowledge of fields that I would like to enter
- A greater depth of knowledge concerning last year's curriculum
- A better understanding of manufacturing technology (3)
- More in-depth views of the classes and shop information to help me decide on a job shadow

EVERETT

- More skills, knowledge learned (3)
- More knowledge into a technology degree
- Jobs throughout factory pros/cons of jobs
- More detailed and in-depth education, skills from what we learned in 1st year (4)
- A better understanding about manufacturing and how some of the tasks performed at Boeing and other technical businesses are accomplished
- A better understanding of the manufacturing world (2)
- A good dependable job to fall back on for third year
- Learn more about manufacturing and what jobs there are
- Proper procedure for some things
- More about Boeing and manufacturing
- More advanced technology and manufacturing skills (3)
- Work in shop experience. Understanding of what job I'd like to do or "job shadow"
- More hands on experience and more about the Boeing company and their goals
- Comfort on the job
- More understanding

RENTON

- I expect to gain knowledge about how the Boeing company works, and get more familiar with the manufacturing environment (2)
- More hands-on experience. Opportunity for full-time job at Boeing
- More experience in technical fields (3)
- I would like to narrow down the field that I want to study in college
- More knowledge relating to the manufacturing field
- Having fun working in the shop area (2)

- More knowledge with computers and what it takes to make quality technology
- To gain working knowledge in how a factory operates
- Leadership skills, team skills, manufacturing and the business end of it
- Experience and useful skills (2)
- More education in the manufacturing world
- Confidence in my work, ethics, and abilities
- Experience in manufacturing and teamwork skills
- Lots of knowledge on how planes are built from ground up
- A lot more work related problem solving
- More working skills, ability to learn more than last year
- More hands on experience and training working with others
- More insight to possible career choices (2)

4. You are **81%** - Male **19%** - Female

5. *The second year summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Please check one answer for each topic.*

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
Labor and industry relations	9	58	28	6
Resource management and manufacturing	15	54	28	4
Group dynamics and communication	46	39	13	1
Customer relations	36	48	15	1
Project alignment	22	36	30	12
Blueprint interpretation	33	51	15	1
Numerical control	10	44	36	10
Optics in manufacturing	28	32	20	20
Manufacturing unit cost	13	38	36	13
Project evaluation	17	52	28	3
Customer buy-off	18	50	22	10

6. *The following questions relate to the high school courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

		%			
	STATEMENT	**SA**	**A**	**U**	**D**	**SD**
A.	Teachers helped me see the purposes for what I was learning	12	52	18	15	4
B.	New information was connected to what I already know	10	60	13	12	4
C.	The information to be learned was related to practical, real-life applications	16	40	18	22	4
D.	The information in one class was related to what was being taught in other classes	7	35	19	27	12
E.	Students were encouraged to use the knowledge gained to solve problems	16	56	13	10	4
F.	Students worked together as a team	24	28	18	25	6
G.	Students had opportunities for hands-on learning	26	43	2	25	5
H.	Courses were taught in an interesting manner	9	43	15	15	19
I.	Teachers showed that they really cared about me	16	32	27	16	9
J.	Teachers sometimes worked together to plan or present the class	7	38	29	19	6

7. a. *Do you have any education plans after high school graduation?*

97% - Yes **3%** - No

b. *If yes, what are your educational plans?*

AUBURN

- College
- Marines
- To go to a 2-year school
- College degree in mechanical field
- Community college (5)
- Go to Bates for 2 years then to a University for electrical engineering
- A 2-year manufacturing engineering degree from a community college
- I would like to be the Aircraft mechanic
- To go to college and study on the career choice I'm looking into
- Army

- Go to an electronics school
- 2-year Associates in engineering, then transfer to a 4-year
- Attend P L V
- Washington State University (2)
- Whatcom Community College or Western Washington University

EVERETT

- Community college (10)
- College (7)
- Community college, possibly the Navy
- Community college to get manufacturing degree
- Navy
- Technical school in Phoenix, Arizona
- Community or technical college
- Marine Corps

RENTON

- Attend a 2-year college
- Attend 2-year community college then transfer to a university (2)
- Washington State University (2)
- Attend Community College (10)
- Howard University
- I plan to go to Shoreline Community College and work towards an AA following Technology prep guidelines
- College
- Attend a Technical College (2)
- Community College or Technical College

c. *Have you ever discussed these plans with your parents family?*

94% - Yes **6%** - No

8 a *Do you have any work plans after high school graduation?*

82% - Yes **18%** - No

b *If yes, what are your work plans?*

AUBURN

- Part-time
- Marines/Boeing
- Work for U P S
- Work
- Something in electrical work
- Work at current job

- Boeing or other manufacturing plant
- I'll work 40+ hours
- To always keep a job
- Do the internship and attend Pierce for 2 years, then try to get a job with Boeing
- Army
- Part-time
- I would like to try and get a $10/hr job in Provo, Utah at a shop
- Boeing Technical prep
- Working weekends at Toys R Us. Also taking College classes at night
- Receptionist part-time, referee

EVERETT

- Get a job in manufacturing
- To get a good paying job
- Work
- Working at Giddens for a while longer
- Work to help pay for college
- Safeway
- Navy
- Summer job
- Work with Chevron
- Work at Boeing
- Boeing
- Part-time job
- To maybe hide at Boeing after 3rd year
- Boeing internship
- Second year at Boeing and a roofing job

RENTON

- Continue working at part-time job
- Attain a full-time job to pay for college
- Boeing technology prep
- Boeing and Cape Cod
- King County Animal Control
- Work part-time (2)
- Working for UHAUL
- Part-time for Cinaplex Odeon
- Work in a grocery store
- Find a better job than McDonald's
- Boeing internship and Schucks Auto Parts
- I work for Ameriflight at Boeing Field
- Work as a freshman to earn money for school

- Managing an espresso stand
- Full-time or part-time job through college (2)
- Probably working way through some school

c. *Have you ever discussed these plans with your parents family?*

91% - Yes **9%** - No

9. *What is your ethnic background? Circle one. If your ethnic background covers more than one of the specific choices provided below, please check "other" and specify.*

Asian or Pacific Islander	**8%**
Hispanic, regardless of race	**3%**
Black, not of Hispanic origin	**4%**
White, not of Hispanic origin	**49%**
American Indian or Alaskan Native	**6%**
Other (specify)	**66%**

10. *How would you rate your ability to learn mathematics?*

29% - Excellent **39%** - Good **25%** - Fair **7%** - Poor

11. *How would you rate your ability to learn science?*

38% - Excellent **48%** - Good **13%** - Fair **1%** - Poor

12. *How would you rate your ability to learn to write well?*

36% - Excellent **33%** - Good **28%** - Fair **3%** - Poor

INTERMEDIATE INTERNSHIP POST RESULTS FOR SEATTLE

(Last Week)

(n = 66)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

Site **24** - Renton
22 - Everett
20 - Auburn

1. *The second year summer internship is designed to teach you about topics such as those listed below. How much have you learned through this summer internship? Please check one answer for each topic.*

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
Labor and industry relations	42	52	5	2
Resource management and manufacturing	31	59	8	2
Group dynamics and communication	70	29	2	--
Customer relations	46	49	3	2
Project alignment	57	31	7	5
Blueprint interpretation	63	31	5	2
Numerical control	16	47	19	19
Optics in manufacturing	53	34	11	2
Manufacturing unit cost	36	47	16	2
Project evaluation	37	51	10	2
Customer buy-off	36	45	17	2

2. a *Do you have any work plans after high school graduation?*

75% - Yes **25%** - No

b. *If yes, what are your work plans?*

AUBURN

- Job to support education

- In restaurant
- Work
- Work through college
- CNC - mech
- A job doing construction
- Become a machinist
- Work at Boeing (2)
- U.S. Army
- PIT
- HC Tech
- Non-destructive technician

RENTON

- Take off the rest of the summer, then work full time
- To make spending money for college
- Try to be hired on at Boeing (3)
- Hopefully attain a full-time job with Boeing while going through college
- Make money
- Working/college
- Espresso stand, night classes
- Personal
- I am working at Ameriflight (Boeing field)
- Schuck's
- Work for King County Animal Control (Seattle)
- Work at grocery store
- Part-time (2)
- Part-time while in college
- Work around school (2)
- Pepsi (sort palettes)

c. *Have you ever discussed these plans with your parents family?*

86% - Yes **14%** - No

3. *The following questions relate to your summer Boeing internship. For each of the statements listed below, please circle one of the following ratings: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	% SA	A	U	D	SD
A.	The Boeing instructors helped me see the purposes for what I was learning	23	68	9		
B.	New information was connected to what I already know	39	48	9	5	
C.	The information to be learned was related to practical, real-life applications	46	39	16		
D.	The information in one class was related to what was being taught later in the internship	26	61	9	5	
E.	Students were encouraged to use the knowledge gained to solve problems	41	50	7	2	
F.	Students worked together as a team	52	48			
G.	Students had opportunities for hands-on learning	59	36	2	2	
H.	Courses were taught in an interesting manner	11	55	23	11	
I.	The Boeing staff showed that they really care about me	18	57	23	2	
J.	The instructors sometimes worked together to plan or present the class (team teaching)	23	43	25	7	2
K.	I feel that manufacturing would be an interesting career field	36	30	23	9	2
L.	The instructors knew their subject content well	25	55	16	5	
M.	The instructors treated me as a responsible adult	18	50	14	16	2
N.	Compared to my high school classes, I feel that I was more successful as a learner at Boeing	57	32	5	7	
O.	Learning can be fun	46	48	5	2	
P.	I would recommend this internship to my friends	68	30	2		
R.	I generally discussed my internship experiences with my parents/family at least weekly	52	36	5	7	
S.	This internship will help me with my future education	55	45			
T.	This internship will help me with my future employment	59	30	11		
U.	The Boeing staff sometimes made program changes based on input from students interns	36	43	18	2	

4. *How would you rate your ability to learn mathematics?*

25% - Excellent **48%** - Good **18%** - Fair **9%** - Poor

5. *How would you rate your ability to learn science?*

39% - Excellent **52%** - Good **9%** - Fair **0** - Poor

6. *How would you rate your ability to learn to write well?*

41% - Excellent **39%** - Good **18%** - Fair **2%** - Poor

7. *What were the major strengths of your Boeing summer internship?*

AUBURN

- Teamwork and listening to people (3)
- The opportunity to learn about items not included in regular public schooling curriculum
- The whole program was great, and the shop skills, very fun and (educational)
- Blueprint interpretation, optics (theodolite)
- Working with my hands and learning how to do most of the manufacturing
- Working together, rivets, holding anger towards instructors, following blueprints, instructions, plans
- Technical skills
- Learned more skills
- The fact that we were taught in a hands-on manner and that separate subjects were connected together
- Teamwork and optics
- The hands-on learning which made it much easier to understand as well as learn
- Teamwork courses. Also the beam project lead position gave me the chance to have some more responsibility which was good for me.
- I got to know other people better
- Major strengths are the hands-on. The whole entire learning experience. Also the career speakers for giving us a better insight on the jobs available.
- Team building (2)
- I gained a lot of knowledge that will be a valuable start for me in life. I learned basic procedures and manufacturing skills.
- Teamwork and group dynamics

RENTON

- Learning some of the skills you need to work here at Boeing early
- Learned many things, and got a better idea of what I want to do later on
- Teamwork, group dynamics, getting along with others (9)
- Teamwork, experience, knowledge gained

- My leadership, team dynamics, problem solving, easy to learn and easy to understand nature
- Learning so much more about the real world and how much opportunity there is
- More hands-on activities, less sitting, not as much lecture
- I liked getting paid and learning how to work with machines.
- I now have a general idea of what career I want to have in the future
- That I could be a major part of a successful group
- I learned a lot about the manufacturing process first hand. (3)
- The riveting projects, blueprint reading
- This year was mostly hands-on, which is my more preferred style of learning.
- Gathering information based on my knowledge learned in high school, helps me understand and improve my learning ability.
- Hands-on projects (2)
- Learn fast

8. *What were the weaknesses of your Boeing internship?*

AUBURN

- All of the preaching and general orientation and support towards two-year schools (technical colleges) and not university-based educational experiences (WSU).
- Instructors—only one in shop that knew what was going on. In class instructors seemed to feel superior.
- Optics (transit, level), assembly of beam project
- Need some hands-on in the machine shop
- Boring class and repeats of the same stuff we learned were the biggest weaknesses.
- I got bored a lot.
- Hostilities that built under stress between students and between students and instructors
- The class time, the union [?] people too long
- Blueprint interpretation
- Some of the classes were boring and dry and were a lot harder to understand
- The boring class time, if there was just a little bit less, it would be better (2)
- Math/writing skills
- More hands-on, machine shop skills (2)
- Not a good mix between class and shop. We needed to work some in the class and some in the shop. Then class and shop. Mix it up some more. Class was too long before we could adapt the skills.

RENTON

- Class and lecture that were drawn out to the point of incomprehension, process check
- Drillings, and tooling were very screwed up, and influenced our grade through no fault of our own
- Being taught something too quickly so I couldn't understand it fully

- Staying awake when career speakers were talking too long
- Too much sitting, more shop time (5)
- Waking up early
- I did not agree with some of the other's ideas and that personal disagreement held me back.
- The weaknesses are sometimes I felt like it was hard to understand the language the instructors used. I felt like they thought I understood the terms they used a lot more than I did.
- Some of the instructions given to us by our supervisors were severely flawed, which affected our grade.
- We only got to make one project (beam project).
- It was a gloss over of everything.
- Sitting in class and not learning more about our projects
- Math
- I didn't really understand how to make my project, more training
- Not enough career speakers related to manufacturing. Spend time out in the factory.
- I didn't speak out enough, wasn't as social as I should be
- Went by too fast, take more time to explain things in detail
- Staying focused
- Riveting, blueprint reading

9. *What changes would you suggest for improving the Boeing internship for next year?*

AUBURN

- Offer more general scholarships that all interns can apply for, support for those seeking degrees more complicated than a two-year technology degree
- More planning, listen to the students, they are brilliant not dumb. More organization, looser on rules. We are adults! Treat us with respect, you shall receive it. More explanation about jobs and job tasks in company.
- Better pay and longer internship. Hey, it could happen.
- Teach the students respect for one another and for instructors
- Shorter classes with more hands-on, relating to the subject we are studying (2)
- Less classroom stuff and more manufacturing stuff
- When going on a tour we need to have hands-on
- Get more physically involved with things we learn (shop projects, crane, field trips, etc.)
- Better projects
- Different career speakers, more time spent on studying the blueprints before the final project
- Longer period of time to learn more manufacturing information
- Make all courses directly flow into final project
- Move around more often, see different classes
- Go through in more detail: blueprints, use of assemble tools, BAC codebook

- More hands-on work (2)
- Allow more time for project

RENTON

- More point deviations as a way of motivating. Have process check not so forceful as to find things wrong with the internship.
- New drill/tools
- Better tools and jigs, telling us more things ahead of time
- Learning skill directly associated with a task
- Give more or all information at the beginning of projects and as they go along again. Keep busy.
- More help. I think it would help a lot to have more than one instructor who knew the lesson plan and actually knew how to do the project.
- Prepare themselves well ahead of time and go through the process at least once before they introduce it to us
- Second year is during a later time period so we can do more over the summer
- Make the program longer (the entire summer), so the kids can learn more. Instead of giving kids a choice on how to make projects, make sure the simulation last longer, have them make more beams (instead of 11, how about 30), and make them do the project in an assembly style manner. I believe that this would give the students a better understanding of the manufacturing business. Also I believe the unit cost and processes of the project should be discussed fully before work is done.
- More interactivity, movement
- Only speakers we can job shadow. More tours, more small group work. Longer lunch - 35 minutes.
- More information on possible careers. Not such a "school structure." Work with Boeing employees.
- Keep up with the faster students
- More emphasis on manufacturing, job, etc. More time to complete projects.
- More hands-on associated with the things we learn. More activities with learning
- Make it more interesting when you're sitting in the classroom
- Less sitting, more in shop skills, more hands-on (3)
- Learn more about other intern classes and visit other Boeing plants
- Keep students persisting with experience instead of listening to speakers

10. *What kind of things might be done during your next year of school to keep you focused on future career possibilities in manufacturing technology?*

AUBURN

- Take manufacturing course
- Look at job titles in the newspaper, visit different companies
- Continue the internship
- Take some classes that you think you might want to do

- Looking at the classes that need to be taken for my future
- Occasional contact by a Boeing representative to remind interns about the next summer - future (i.e. mail, phone)
- Understand the concept totally
- Need a faster pace in class and a slower pace in the shop
- Going to be a electrician, so I'm going to Bates
- Study different careers in manufacturing technology
- Send flyers, keep students updated
- Learn more about everything
- Keep on top of the manufacturing world and know what is changing
- Work on machine courses at Bates
- Looking at classes available
- Take classes related to field
- Maybe a more career speakers, more hands-on stuff
- Continuing my education and doing things in that line of career choice

RENTON

- Work in manufacturing or some facet of it, while schooling
- Manufacturing and technical courses (2)
- Computer manufacturing classes
- Manufacturing courses, computer electronics
- Take only classes related to the job
- More math and lots of speech classes
- Working hands-on with Boeing workers
- It depends on what career I choose to take
- Job opportunities, planning for careers
- Keep an open mind
- Maybe to keep us informed on the job outlook in manufacturing
- Keep in contact with me
- Take interesting classes relating to manufacturing. Be open-minded
- Have a special Tech Prep class offered 6th period so we can be taught all year round
- I might work in an engineering office and go to night school
- Take classes to earn my manufacturing degree
- Taking the recommended classes at community college
- Entering General Manufacturing at South Seattle Community College

APPENDIX E
ADVANCED INTERNSHIP PRE RESULTS FOR PORTLAND

(First Day)

(n = 4)

This survey is intended to give us some useful background about the students who are entering the third year of the Boeing Student Internship Program. The information will be held confidential and will not affect your participation in the program. If you do not understand a particular question please feel free to ask. Please use the self-addressed envelope to return your completed survey.

1. *Were you attending any schools when you entered your third year Boeing internship?*

   4 - Yes **0** - No (Skip to Question 2)

   If yes, what is the name of the school?

   4 - Mt. Hood Community College

   What is the name of your educational program?

   - Machine Tool Technology (4)

   You were attending the program: **4** - Full-time **0** - Part-time

2. *Where you employed when you entered your third year Boeing internship?*

   4 - Yes **0** - No (Skip to Question 3)

   If yes, were you being employed full-time or part-time?

   4 - Full-time **0** - Part-time

   What is your job title?

   - Cashier
   - Equipment operator
   - Make shelter fittings and set up shelters
   - Machinist

   Did you have any difficulty arranging with your employer to participate in this year's Boeing internship?

   0 - Yes **4** - No

3. *What are your educational plans?*

- 2-year Machine Tool degree
- Get my Associates Degree (2)
- To get my Associates Degree in Machine Tool and then fire science degree

With whom have you discussed your education plans?

2 - Teacher **1** - Counselor **4** - Parent or Guardian
1 - Internship coordinator
1 - Other (specify)

4. *What are your plans for employment?*

- Next summer
- To be a machinist
- Not sure
- Work in a machine shop

With whom have you discussed your plans for employment? Please check all that apply.

1 - Teacher **0** - Counselor **3** - Parent or Guardian
1 - Internship coordinator
1 - Other (specify)

- Friends, family

5. *What is your ethnic background? Circle one. If your ethnic background covers more than one of the specific choices provided below, please check "other" and specify.*

0 - Asian or Pacific Islander
0 - Hispanic, regardless of race
0 - Black, not of Hispanic origin
4 - White, not of Hispanic origin
0 - American Indian or Alaskan Native
0 - Other

6. *Your gender*: **4** - Male **0** - Female

7. *What do you expect to gain from your third year summer internship experience?*

- A better understanding of a bigger business such as Boeing
- Knowledge, good work ethic
- Practical experience that I can take back and use at school

- Knowledge of how the company works, more indepth than the two previous

8. *The third-year summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Please check one answer for each topic.*

Topics	% A Lot	Some	Little	None
A Group dynamics and communication		4		
B Measurement	3	1		
C Safety and health	3	1		
D Quality assurance	2	1	1	
E Print interpretation		4		
F Shop skills	3	1		
G Business economics		1	3	
H Resource management and manufacturing computing		1	3	
I Product and process control		1	3	
J Labor and industry		4		

9. *The following questions relate to the college courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	SA	A	U	D	SD
A	Instructors helped me see the purposes for what I was learning	2	2			
B	New information was connected to what I already know	2	2			
C	The information to be learned was related to practical, real-life applications	2	2			
D	The information in one class was related to what was being taught in other classes	1	2			1
E	Students were encouraged to use the knowledge gained to solve problems	2	2			
F	Students worked together as a team		2	1	1	
G	Students had opportunities for hands-on learning	2	1	1		
H	Courses were taught in an interesting manner		4			
I	Instructors showed that they really cared about me	2	1	1		
J	Instructors sometimes worked together to plan or present the class	1	3			

ADVANCED INTERNSHIP POST RESULTS FOR PORTLAND

(Last Week)

(n = 4)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question, please feel free to ask.

1. *The third-year summer internship was designed to teach you about topics such as those listed below. How much have you learned through this Boeing summer internship about each of the following topics?* Please check one answer for each topic

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
A. Group dynamics and communication	4			
B. Measurement	3	1		
C. Safety and health	2	2		
D. Quality assurance	3	1		
E. Print interpretation	2	2		
F. Shop skills	4			
G. Business economics	2	2		
H. Resource management and manufacturing computing	2	1	1	
I. Product and process control	3	1		
J. Labor and industry	4			

2. *The following statements relate to your summer Boeing internship. For each statement listed below please circle one of the following ratings: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

	STATEMENT	SA	A	U	D	SD
A.	The Boeing instructors helped me see the purposes for what I was learning	2	2			
B.	New information was connected to what I already know	3	1			
C.	The information to be learned was related to practical, real-life applications	2	2			
D.	The information in this summer's internship was related to what I had learned in the prior year's internship	3	1			
E.	Students were encouraged to use the knowledge gained to solve problems	2	2			
F.	Students worked together as a team within assigned work units.	2	2			
G.	Students had opportunities for hands-on learning	3	1			
H.	Courses were taught in an interesting manner	3	1			
I.	The Boeing staff showed that they really care about me	3	1			
J.	The instructors sometimes worked together to plan or present the class (team teaching)	2	1	1		
K.	I feel that manufacturing would be an interesting career field	4				
L.	The instructors knew their subject content well	3	1			
M.	The instructors treated me as a responsible adult	2	1	1		
N.	Compared to my college classes, I feel that I was more successful as a learner at Boeing	3	1			
O.	Learning can be fun	2	2			
P.	I would recommend this internship to my friends	4				
R.	I generally discussed my internship experiences with my parents/family at least weekly	3	1			
S.	This internship will help me with my future education	3	1			
T.	This internship will help me with my future employment	4				
U.	The Boeing staff sometimes made program changes based on input from student interns	3	1			

4. *Have you changed your plans for employment after completing your education?*

2 - Yes **2** - No

If yes, what are your new plans?

- I want to get into my own business down the road.
- New goal is to earn a journeymens certificate either here at Boeing or any other shop.

Has your participation in the Boeing Internship influenced your change in plans?

3 - Yes **1**- No

If yes, how?

- It showed me what I need to know to be successful.
- Talking to some of the other employees.
- Bureaucracies got old.

5. *What were the major strengths of your Boeing summer internship?*

- Learned a lot about the shop and what you have to do to be a successful employee. Also learned what kinds of tools I need.
- Had lots of fun. Learned a lot from the maintenance machinist.
- The hands-on experiences, the new friends, the computer skills gained.
- It gave me a spark of interest to a careerpath. I was clueless as to what I was going to do after high school until I became involved in the program.

6. *What were the weaknesses of your Boeing internship?*

- Not long enough!
- During the 1st and 2nd year programs there was a lot of sit down class time and it would be more helpful if there was more hands-on.
- The food, the pay.
- The Heat in 001, confusion of when and whereabouts of the meeting.

7. *What changes would you suggest for improving the <u>third year</u> Boeing internship (for example changes in content, ways it was delivered, involvement of mentors, etc.)?*

- Don't do it during 4th of July weekend. It kind of messes things up such as planning.
- Go to Burger King. Everything else was really good and doesn't need improvement.

- The experiences that I received were just what I was hoping for, being able to run machines out in the plant, working on tools in tool lab
- Sturdier structure of meetings

8. *Now that you have completed three years of the internship, what suggested changes do you have for improving the first two years of the internship?*

- I thought everything had a purpose that was taught. You really can see it after the 3rd year.
- I think there should be more activity (shop time, field trips, etc.) in the 1st year.
- I feel they need more hands-on learning and not so much sit down lectures.
- They did a good job of weeding out the people not really interested.

9. *What curriculum content do you feel could have been eliminated from the internship program?*

- Some of the people that came in and talked to us could have took us out in the shop and showed us what they did and where it was located.
- There are kids that come to the internship for different types of education. I think the curriculum is good because it covers most of what is here at Boeing.
- I would eliminate catia because I didn't understand it until I had autocad in college.
- All was good.

10. *What curriculum content or experiences would have liked to see added to the internship?*

- I would like to see more CNC programming added to the curriculum.
- Blueprint.
- The use of manual machines.
- Possibly some more blueprint interpretation and let them go out in the plant and work with someone who uses blueprints constantly.

11. *What additional comments would you like to share about the internship?*

- I learned a lot through this internship. It really showed me what I want to do now. It was the most educational experience I have ever had. I am really glad I choose and got accepted into the internship. It opened many doors. Thank you.
- It kicked butt.
- The mentor that I was with did an exceptional job. He was full of knowledge and worked me through things completely until I fully understood them.

APPENDIX F
ADVANCED INTERNSHIP PRE RESULTS FOR SEATTLE
(First Day)

(n = 34)

This survey is intended to give us some useful background about the students who are entering the third year of the Boeing Student Internship Program. The information will be held confidential and will not affect your participation in the program. If you do not understand a particular question please feel free to ask. Please use the self-addressed envelope to return your completed survey.

Site **13** - Auburn
11 - Everett
8 - Renton
2 - Other

1. *Were you attending any schools when you entered your third year Boeing internship?*

65% - Yes **35%** - No (Skip to Question 2)

If yes, what is the name of the school?

AUBURN
- Highline Community College
- Pierce Community College (2)
- Bates Technical College (2)
- Green River Community College (3)
- Eastern Washington University
- South Seattle Community College

EVERETT
- Shoreline Community College (2)
- Washington State University
- Everett Community College (2)
- E D C C

RENTON
- Universal Technical Institute
- NSCC
- Green River Community College
- Seattle Central Community College (2)

OTHER THAN BOEING
- Shoreline Community College
- N.S.C.C.

What is the name of your educational program?

AUBURN
- Electronics engineering
- Technical Prep Manufacturing (3)
- Manufacturing technology
- Psychology
- Accounting
- Basic course requirements, general (3)

EVERETT
- General
- Communications
- Computer manufacturing technology
- ATA in manufacturing (2)
- Tech Prep

RENTON
- CAD
- Liberal Arts
- Electronics engineering
- General A.A.

OTHER THAN BOEING
- Computer science
- Drafting

You were attending the program: **71%** - Full-time **29%** - Part-time

2. *Where you employed when you entered your third year Boeing internship?*

74% - Yes **26%** - No (Skip to Question 3)

If yes, were you being employed full-time or part-time?

56% - Full-time **44%** - Part-time

What is your job title?

AUBURN
- Electronics Technician
- Sheet metal/welding

- Laborer at Flags Up Feed and Tack
- Assembly Technician
- Laborer
- Sales Associate
- Bus Boy at Denny's restaurant
- Student in Automotive

EVERETT
- Cashier/Stock Crew
- Pro-Shop staff
- King County Library System
- I was in tooling at Total Rental
- Maintenance/Groundskeeper
- Detail Personnel, Mechanic
- Molder
- Cook
- Landscaper
- Sales associate (Petco)

RENTON
- Fleet Assistant
- Sales Representative
- Stockperson
- Framer/Journeyman
- Prep cook, Supervisor, Driver
- Customer Service Cashier
- Assembly worker

OTHER THAN BOEING
- Delivery

Did you have any difficulty arranging with your employer to participate in this year's Boeing internship?

12% - Yes **88%** - No

3. *What are your educational plans?*

AUBURN
- Computer electronics
- Finish college (4)
- Continue Technical College
- Undecided, but planning on continuing
- To get my B.A. in Psychology and a minor in science and a Master's in Psychology

- Going to college
- To finish course #3 and go to Green River
- Continue college

EVERETT
- To become a teacher
- To attend a Community College in Fall. Course of study to be manufacturing technology
- Finish my B.A. at Washington State University in Communications
- Obtain two-year degree and pursue four-year degree in computer manufacturing technology
- Finnish my ATA degree
- To attend community college to further my education
- Graduate from Western Washington University
- Technical school
- To continue my education through school and work
- Go to school and work full-time

RENTON
- To receive my 4-year degree in my particular field of study
- Teaching/Aviation, applied science
- Learn, get smart, and do something with my life
- Finish a two-year degree in manufacturing engineering
- 2- or 4-year college. No major decided
- Transfer/Get A.A.

OTHER THAN BOEING
- 2 years at Shoreline Community College, then transfer to the University of Washington
- 2-year degree

With whom have you discussed your education plans?

32% - Teacher **47%** - Counselor **82%** - Parent or Guardian
38% - Internship coordinator
21% - Other (specify)

AUBURN
- Friends (2)
- Family

EVERETT
- Spouse
- Friends

RENTON
- Girlfriend

4. *What are your plans for employment?*

AUBURN
- Anything electronic, computers
- Crystal Mountain for the winter
- Machinist
- To seek out a high paying job
- Plan on working after internship
- Move to engineering then go from there
- Boeing and odd jobs
- Find a job
- Boeing

EVERETT
- To get a good job to start off with
- To start working full-time in a manufacturing related field (2)
- Broadcasting (T.V. or Radio)
- The Boeing company (4)
- Work in a fun job

RENTON
- To be employed with Boeing in the CAD department
- To land a place in a job which offers me the opportunity to grow and expand my knowledge
- Teaching
- Generally be my own boss, but until then be the best at what I do
- I hope to come back to work for Boeing (3)

OTHER THAN BOEING
- Hopefully employment through Boeing
- Eventually a job that includes CAD

With whom have you discussed your plans for employment? Please check all that apply.

12% - Teacher **27%** - Counselor **82%** - Parent or Guardian
35% - Internship coordinator
15% - Other (specify):

AUBURN
- Friends (2)

EVERETT

- Spouse
- Friends

OTHER THAN BOEING

- Fiancee

5. *What is your ethnic background? Circle one. If your ethnic background covers more than one of the specific choices provided below, please check "other" and specify.*

3% - Asian or Pacific Islander
3% - Hispanic, regardless of race
3% - Black, not of Hispanic origin
74% - White, not of Hispanic origin
6% - American Indian or Alaskan Native
12% - Other (specify)

6. *Your gender:* **71%** - Male **29%** - Female

7. *What do you expect to gain from your third year summer internship experience?*

AUBURN

- A better understanding or desire in choosing a job I will enjoy
- Job skills, floor experience
- To gain more knowledge and open up more opportunities for myself
- More experience. Learn steps on how to get employed. Meet people who can pull strings and give good impressions of future employers/instructors
- To get hooked up with a job
- More knowledge in the manufacturing field to better prepare myself for a future at Boeing
- As much as is offered plus more
- Job experience and concrete proof that I can do this sort of thing
- To gain a wide area of hands-on experience is my goal this year. I also hope to learn more manufacturing skills for my future
- To learn about planning and manufacturing
- I expect to gain knowledge of what hob I'd like to do and what class to take in college
- A good direction as of what to follow up at college for future employment
- Knowledge of the careers I'm interested in

EVERETT

- Valuable job experience, an opportunity to show the skills I learned from the past two summers of this internship

- Confidence and ability in tasks performed in the manufacturing field. The ability to communicate and work with others
- New experience with a large company. More "team" skills and a new view of what to do in the future
- I hope to gain hands on experience working with airplanes so that I can apply it to a job with Boeing
- New job experience
- Experience or a job with the company
- More knowledge about paint prep and to be a diversified worker. Hopefully a job or career at Boeing. More information on a resume
- To learn more about the manufacturing process
- Knowledge. A step in life toward a good career
- An experience that would make me more of an asset to their company
- I want to know the opportunities I have and I want to gain more abilities too so I can hopefully get hired

RENTON

- Knowledge in the field of Boeing's drawing system and computer (CAD) program
- To get a grasp on what I want to do with my life and future employment
- What parts of Boeing I like the most and how everything ties together
- I expect to get a more focused idea of what I want to do as a career
- A better idea of what jobs are of interest to myself
- All types of work offered at Boeing. Try to decide what title to pursue
- A better understanding and more clear path set to which job I would enjoy and like to go after
- Knowledge in the manufacturing field

OTHER THAN BOEING

- More insight into the manufacturing field. I also hope to gain employment into the Boeing corporation
- More experience from a new place

8. *The third-year summer internship is designed to teach you about topics such as those listed below. How much do you know about each of the following topics? Please check one answer for each topic.*

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
A. Group dynamics and communication	42	52	6	
B. Measurement	39	46	15	
C. Safety and health	61	39		
D. Quality assurance	21	61	18	
E. Print interpretation	15	36	49	
F. Shop skills	49	45	6	
G. Business economics	12	58	30	

Topics	% A Lot	Some	Little	None
H. Resource management and manufacturing computing	12	49	36	3
I. Product and process control	27	46	21	6
J. Labor and industry	18	55	24	3

9. *The following questions relate to the college courses you took this past school year. For each statement please provide one of the following ratings by circling: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

STATEMENT	% SA	A	U	D	SD
A. Instructors helped me see the purposes for what I was learning	43	36	11	11	
B. New information was connected to what I already know	39	43	14	4	
C. The information to be learned was related to practical, real-life applications	36	43	4	14	4
D. The information in one class was related to what was being taught in other classes	25	36	18	14	7
E. Students were encouraged to use the knowledge gained to solve problems	50	36	11	4	
F. Students worked together as a team	33	22	19	15	11
G. Students had opportunities for hands-on learning	31	19	19	19	12
H. Courses were taught in an interesting manner	15	48	26	11	
I. Instructors showed that they really cared about me	18	39	36	7	
J. Instructors sometimes worked together to plan or present the class	29	14	4	36	18

ADVANCED INTERNSHIP POST RESULTS FOR SEATTLE

(Last Week)

(n = 26)

This survey serves as a follow-up to the survey you completed on the first day of this summer internship. Please return your completed survey to the internship coordinator. If you do not understand a particular question please feel free to ask.

Site: **13**- Auburn
3 - Everett
7 - Renton
3 - Other

1. *On what basis will you follow in selecting your courses when you go back to school after this summer? Check all that apply.*

0 It depends on the classes my friends are taking
0 How easy the class is said to be
85% How it fits into my future educational plans
92% How it fits into my future work plans
58% Graduation requirements
39% Advice from a counselor
19% Advice from a teacher
27% Advice from parents/family
15% Other (specify):

AUBURN
- Advice from me

EVERETT
- I plan to see how my job goes for a few quarters

RENTON
- Self interests

OTHER THAN BOEING
- My interests

2. *What are your educational plans?*

AUBURN

- To get a degree in manufacturing technology (2)
- 2 year degree in manufacturing tech, and perhaps continue on 4 year
- Continuing at Green River Community College in the mechanist program
- Taking classes required to get a job
- Start at Bates next Spring
- To acquire a Certificate of Completion or Associates Degree in electronics
- Continue in electronics for 2 years and 4 years
- To finish school and get my drafting degree
- To get a Bachelor's degree
- To get a degree in communications and psychology
- Finish college
- To get my degree at Green River Community College and other required courses

EVERETT
- Finish my degree in manufacturing
- Major in Broadcasting at Washington State University

RENTON
- Continue to get A.A. transfer
- I plan on earning a Bachelor's Degree - Major undecided
- Currently undecided
- Get an Electronics engineering degree
- To continue at Seattle Central
- Teaching Degree (Teaching drafting, aviation, introduction to computers)
- To become a computer specialist

OTHER THAN BOEING
- To get my CIM Degree
- Graduate with B.A. Degree in electrical engineering at University of Washington
- CAD for Industrial Applications. AAS Degree
- 4-year degree

With whom have you discussed your education plans?

31% - Teacher **42%** - Counselor **87%** - Parent or Guardian
65% - Internship coordinator
35% - Other (specify):

AUBURN
- People and job-shadow sponsor
- Instructor, employees
- Sponsor
- Friends and family
- People I shadowed

EVERETT
- Boeing employers
- Friends

RENTON
- Fiancee

3. *The following statements relate to your summer Boeing internship. For each statement listed below please circle one of the following ratings: Strongly Agree (SA), Agree (A), Uncertain (U), Disagree (D), or Strongly Disagree (SD).*

STATEMENT	% SA	A	U	D	SD
A. The Boeing instructors helped me see the purposes for what I was learning	58	35	8		
B. New information was connected to what I already know	54	42	4		
C. The information to be learned was related to practical, real-life applications	65	23	12		
D. The information in one class was related to what was being taught later in the internship	48	48	4		
E. Students were encouraged to use the knowledge gained to solve problems	62	39			
F. Students worked together as a team	54	23	19	4	
G. Students had opportunities for hands-on learning	92	8			
H. Courses were taught in an interesting manner	28	48	24		
I. The Boeing staff showed that they really care about me	50	38	12		
J. The instructors sometimes worked together to plan or present the class (team teaching)	40	28	28	4	
K. I feel that manufacturing would be an interesting career field	46	42	8	4	
L. The instructors knew their subject content well	50	50			
M. The instructors treated me as a responsible adult	50	42	8		
N. Compared to my college classes, I feel that I was more successful as a learner at Boeing	39	35	15	11	
O. Learning can be fun	62	31	8		
P. I would recommend this internship to my friends	85	15			
R. I generally discussed my internship experiences with my parents/family at least weekly	50	50			
S. This internship will help me with my future education	77	19	4		
T. This internship will help me with my future employment	81	19			
U. The Boeing staff sometimes made program changes based on input from students interns	69	23	8		

4. *What are your plans for employment?*

AUBURN

- Work at Boeing, as CNC machinist or drafter (7)
- Assessment, portfolio, resume, fill out an application
- I want to go into an electrician or HVAC career
- Industrial electronics or computer repair and maintenance
- To get a good paying job
- No plans at present, but I'll get a job at school
- On August 8 the assessment will tell me where to go

EVERETT

- I got a job as an assembly mechanic at Boeing
- Work for large television network

RENTON

- My employment plans are to work for Boeing (2)
- To work at the city or Boeing
- Hire on here at Boeing and become an Interior Installing Mechanic
- I hope to hire on at Boeing while I work on my schooling
- Teaching

OTHER THAN BOEING

- To pursue a career at Boeing (2)
- Somewhere in EE field
- CAD Drafter, small to medium sized company

With whom have you discussed your plans for employment? Please check all that apply.

26% - Teacher **31%** - Counselor **92%** - Parent or Guardian
65% - Internship coordinator
31% - Other (specify):

AUBURN

- Sponsor, other employees (3)
- Friends and family

EVERETT

- Never had time to talk, I got the job within 2 weeks.
- Friends

RENTON

- Friends
- Husband

- Fiancee

5. *The third-year summer internship is designed to teach you about topics such as those listed below. How much have you learned through this summer internship? Please check one answer for each topic.*

	%			
Topics	**A Lot**	**Some**	**Little**	**None**
A. Group dynamics and communication	85	15		
B. Measurement	39	35	23	4
C. Safety and health	73	27		
D. Quality assurance	54	42	4	
E. Print interpretation	35	46	12	8
F. Shop skills	69	19	8	4
G. Business economics	35	42	23	
H. Resource management and manufacturing computing	50	39	11	
I. Product and process control	50	46	4	
J. Labor and industry	42	31	19	8

6. *How would you rate your ability to learn to write well?*

50% - Excellent **50%** - Good **0** - Fair **0** - Poor

7. *How would you rate your ability to learn mathematics?*

35% - Excellent **42%** - Good **15%** - Fair **8%** - Poor

8. *How would you rate your ability to learn science?*

39% - Excellent **42%** - Good **19%** - Fair **0** - Poor

9. *What were the major strengths of your Boeing summer internship?*

AUBURN

- Getting better idea of what opportunities are offered in the Boeing company
- Gave me idea of what I actually want to do
- Getting real life applications in the field I'm most interested in
- I learned a whole lot from people I shadowed
- Being able to work side by side or watch actual workers
- Hands-on, doing instead of reading
- The drafting and engineering department

- H.C. maintenance
- Getting ideas for my education and career goals, plus seeing what I liked about the careers I shadowed
- Hands-on experiences and CNC exposure (2)
- Working at the model shop, shop skills (2)
- The people I learned with and from, all of the work put in to this was the strength of the internship. The internship was different from school because it was fun and well explained.

EVERETT

- Learning how to do a specific job, and than being allowed to do that job
- Learning how a "Fortune 500" company works, how to decide what to do for a living

RENTON

- Got lots of hands-on training. Work on the plane.
- I really learned a lot in the short time that I was here. I feel that I have narrowed my career choice. Everyone here at Boeing was really friendly and taught me a lot.
- I think I picked up on a lot of the shop skills very quickly and easily.
- I have met several employees that work in the areas that I'm interested in. I have also gotten along with all of the employees extremely well and become friends with them.
- Able to learn many different things in a short period of time. Hands-on training with real work. Working with computers.
- The hands-on training from some of the people we shadowed. Also, building the web page was an excellent project for us to do and learn.
- The internship gave me good experience in the drafting field and has helped me get a job at Boeing.

OTHER THAN BOEING

- Learning all the skills at Hexcel Interiors to produce a stowbin for an airplane
- Different company, new type of manufacturing
- Shadowing jobs, learning skills and knowledge
- Hands-on in the real workplace. They helped develop the internship towards what I planned my career in computers.

10. What were the weaknesses of your Boeing internship?

AUBURN

- Couldn't sit still to watch
- Didn't really have enough time. Everywhere I went I liked. It was just hard to choose.
- Shadowing the areas of non-interest, but stuck it out anyway
- Electricity
- Sometimes people I shadowed had trouble explaining things

- More time would have been great
- Sometimes very dull, unexciting jobs
- There were too many people involved who didn't have plans for me.
- The areas I went to didn't always apply to our position desired.
- Some of the machines in the machine shop
- Time was the only weakness I found. I still learned, but I would have enjoyed spending more time in the shadowing.

EVERETT

- I don't think it could get any better unless the 3-year topic is changed.
- Not informing supervisors, crews, of the interns in far enough advance

RENTON

- Poor planning
- Some days they don't know who we were supposed to be with or they didn't have anything planned for us to do.
- Not enough time for certain things that we were doing. Sometimes not enough planning for what we were supposed to be doing.
- The major flaw that I have been seeing over and over is that nobody was organized. I take that back, Rich Brohaw had his books together.
- Some of the paper work processes they have to go through are very confusing.
- It could have been a little bit more organized.
- Sometimes person shadowing had nothing for me to do.

OTHER THAN BOEING

- Slow times but not often
- Didn't really know anything about the internship at first, poor guidance

11. What changes would you suggest for improving the Boeing internship?

AUBURN

- More organized binders
- I think the third year should be switched to second year so when you graduate from high school you will know what to take in school.
- Working with at least one other student with same interest if possible
- More prepared for third year with projects to do
- Stay away from the Et. Shop
- Open up the options to more than just manufacturing. Include other aspects
- To start the program 1 year early so it would end when you graduate from High School
- A little bit more contact of sponsor
- Make each sponsor get a schedule from the people that will be shadowed
- To stick to process and not changing
- Make sure students always have something to do

- Keep making it fun, and maybe a little longer

EVERETT
- Moving the interns around to different jobs
- It was a great program!

RENTON
- Make the internship 4-5 weeks
- I would suggest having a set schedule already put together for the student for each day of the internship before they come for their internship. This would help out both the students and their supervisors.
- If it was a little more structured and organized it would flow a lot smoother as far as the daily activities go.
- I would suggest that Boeing start planning for the internships a year in advance. Why I suggest this is because from the lack of planning we were not allowed to do some of the real adventurous stuff. Another reason I suggest this is because then we will be scheduled for enough time that we are not an unexpected burden on the person we job shadow.
- Better preparation for the job selections that interns can choose from
- A different process for our third year of placement for shadowing
- Better planning

OTHER THAN BOEING
- Better communication to outside interns
- Make sure ALL interns know what is going on. I found out several things at the last minute.
- Inform the Intermec site on how the internship should go